CONVERTING FACTORS
AND TABLES OF EQUIVALENTS
USED IN FORESTRY

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CONVERTING FACTORS AND TABLES OF EQUIVALENTS USED IN FORESTRY

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INTRODUCTION

The increasing use of metric measurements in the natural sciences is causing considerable confusion and difficulty in interpreting data. This is particularly marked in forestry where not only are direct measurements involved, but these measurements are also applied to different units of area. Thus while the conversion of centimeters to inches is a relatively simple matter, the conversion of board feet per acre to cubic meters per hectare is fraught with difficulties which are further increased when monetary values are involved. The purpose of this handbook is to provide members of the Forest Service with conversion factors and forest measurements that are more or less frequently encountered in forestry literature. These are expressed in tabular form where it appears most advantageous to do so; in the

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other cases a series of alinement charts have been prepared which permit the direct determination of values in multiple form. There are included also certain other tables giving data more or less commonly used in forest calculations.

In the tables the unit value on which the conversion is based is indicated as **1**. Conversion units are not carried beyond six decimal places. When the final digit is not exact but represents a rounding to the nearest value, it is italicized. Figures in parentheses ( ) below the decimal figure are approximate values for use in rough calculations where a high degree of accuracy is unnecessary. Figures in brackets [ ] below the decimal figure are exact values.

The tables are adapted for ready use. An example or two will best illustrate this. Given the average height of a stand as 42.67 meters, to convert to feet: In table 1, column 9 is headed "Meters"; on the same line with the figure **1** in this column will be found all the various conversion factors that are likely to be needed by the forester; the factor under "Feet" is 3.280833, by which the given height, 42.67 meters, is converted to 139.993 feet. Similarly, a cubic centimeter of a certain tree seed weighs 0.35 gram; how much will a bushel, avoirdupois, of this seed weigh? In table 9 the factor for pounds per bushel, found by locating first the figure **1** under "Grams per cubic centimeter" is 77.6893. This factor gives 27.19 pounds per bushel.

In all the tables, United States units of weight are understood to be avoirdupois unless otherwise specified.

TABLES

TABLE 1.—*Length; unit conversion factors, with approximate values*

Inches	Links	Feet	Yards	Rods	Chains [1]	Miles [2]	Centi-meters	Meters	Kilo-meters
³1	0.126263 (⅛)	0.083333 [1/12]	0.027778 [1/36]	0.00505 (1/200)	----------	----------	2.540005 (2½)	0.0254 (1/40)	----------
7.92	1	0.66 (⅔)	0.22	0.04 [1/25]	0.01 [1/100]	----------	20.11684 (20)	0.201168 (⅕)	----------
12	1.515152 (1½)	³1	0.333333 [⅓]	0.060606 (1/16)	0.015152 [1/66]	0.000189	30.48006 (30)	0.304801 (3/10)	0.000305
36	4.545455 (4½)	3	³1	0.181818 (⅕)	0.045455 (1/22)	0.000568	91.44018	0.914402 (9/10)	0.000914
0.3937 (⅖)	0.04971 (1/20)	0.032808 (1/30)	0.010936 (1/90)	----------	----------	----------	⁴1	0.01	----------
39.37 (40)	4.97096 (5)	3.280833	1.09361	0.198838 (⅕)	0.04971 (1/20)	0.000621 (1/1600)	100	1	0.001
							Furlongs		
198	25	16.5	5.5	1	0.25 [¼]	0.003125 [1/320]	0.025 [1/40]	5.02921 (5)	0.005029 (1/200)
792	100	66	22	4	1	0.0125 [1/80]	0.1	20.1168 (20)	0.020117 (1/50)
----------	----------	5,280	1,760	320	80	1	8	1,609.347 (1,600)	1.609347 (1⅗)
----------	----------	660	220	40	10	0.125 [⅛]	1	201.168	0.201168 (⅕)
----------	----------	3,280.83	1,093.61	198.838 (200)	49.7096 (50)	0.62137 (⅝)	4.97096 (5)	1,000	1

[1] Surveyor's chain; the engineer's chain=100 links of 1 foot each is not used.

[2] 1 nautical mile (termed "knot" as unit of velocity)=1.1516 statute miles=1.85325 km=1 inch of arc on the earth's surface at the Equator.

[3] British units: 1 yard=0.914399 m; 1 foot=30.47997 cm; 1 inch=2.539998 cm; 1 hand=4 inches=10.16 cm; 1 span=9 inches=22.86 cm; 1 cubit=18 inches=45.72 cm.

[4] 1 millimeter=0.1 cm=0.03937 inch=0.00328 foot.

TABLE 2.—*Area or surface; unit conversion factors, with approximate values*

Square inches	Square links	Square feet	Square yards	Square chains	Acres	Square centimeters	Square meters	Hectares	Square kilometers
1	0.015942 (1/63)	0.006944	--------	--------	--------	6.451626 (6½)	0.000645	--------	--------
62.7264 (63)	1	0.4356 (3/7)	--------	0.0001	0.00001	404.6873	0.040469 (1/25)	--------	--------
144	2.295684	1	0.111111 [1/9]	0.00023	0.000023	929.034	0.092903 (1/11)	--------	--------
1,296	20.6612 (20)	9	1	0.002066 (1/500)	0.000207	8,361.31	0.836131 (4/5)	--------	--------
0.155 (1/7)	--------	0.001076 (1/1000)	--------	--------	--------	[1] 1	0.0001	--------	--------
1,550	24.7104	10.76387 (11)	1.19599 (1⅕)	0.002471 (1/400)	0.000247	10,000	1	0.0001	--------
						Square miles			
	10,000	4,356	484	[2] 1	0.1	0.000156 [1/6400]	404.687	0.040469 (1/25)	0.000405 (1/2500)
		43,560	4,840	10	[3] 1	0.0015625 [1/640]	4,046.87 (4,000)	0.404687 (2/5)	0.004047 (1/250)
		27,878,400	3,097,600	6,400	640	1	2,589,998	258.9998 (260)	2.590 (2⅗)
		107,638.7	11,959.8 (12,000)	24.7104 (25)	2.471044 (2½)	0.003861 (1/250)	10,000	1	0.01
		10,763,867	1,195,985	2,471.04	247.104 (250)	0.386101 (2/5)	1,000,000	100	1

[1] 1 mm²=0.01 cm²=0.00155 square inch.
[2] 1 square chain=16 square rods.
[3] 1 acre=area 208.710 (210) feet square=3.16 chains square.

TABLE 3.—*Volume and capacity; unit conversion factors, with approximate values*

United States measure of volume [1]		United States dry measure, quarts	United States apothecaries' and liquid measure [2]				Metric system		
Cubic inches	Cubic feet		Fluid ounces	Pints	Quarts	Gallons	Cubic centimeters [3]	Liters [4]	Cubic meters (steres)
1	0.000579	0.014881	0.554113 (½)	0.034632 (1/30)	0.017316 (1/60)	0.004329	16.3872 (16)	0.016387 (1/60)	--------
1,728	[5] 1	25.714 (26)	957.5	59.8442 (60)	29.9221 (30)	7.48052 (7½)	28,317	28.316 (28)	0.028317 (1/35)
1.80469 (1⅘)	--------	--------	1	0.0625 [1/16]	0.03125 [1/32]	--------	29.5737 (30)	0.029573 (1/34)	--------
28.875 (30)	--------	0.429684 (2/5)	16	1	0.5 [½]	0.125 [1/8]	473.179 (475)	0.473167 (½)	--------
57.75 (58)	0.033420 (1/30)	0.859367 (5/6)	32	2	1	0.25 [¼]	946.359 (950)	0.946333 (1)	0.000946
231	0.133681 (1/8)	3.43747	128	8	4	[6] 1	3785.43 (4,000)	3.785332 (4)	0.003785 (1/265)
0.061023 (1/16)	--------	0.000908	0.033814 (1/30)	0.002113	0.001057 (1/1000)	--------	[7] 1	0.0010 (1/1000)	0.000001
61.0250 (61)	0.035315	0.908102	33.8147 (34)	2.11342 (2)	1.05671 (1)	0.264178 (¼)	1,000.027 (1,000)	1	0.001 (1/1000)
			Bushels						
67.200625 (67)	0.038889 (1/25)	1	0.03125 [1/32]	--------	1.163647 (1⅙)	0.290912	1,101.23	1.101198	0.001 (1/1000)
2,150.42	1.24446 (1¼)	32	[8] 1	--------	37.2367 (37)	9.309177 (9)	35,239.28	35.23833 (35)	0.035239 (1/30)
	35.3145 (35)	908.078 (910)	28.3774	--------	1,056.68 (1,000)	264.170 (265)	1,000,000	999.973 (1,000)	[9] 1

[1] 1 cubic yard=27 cubic feet=21.696 bushels=0.764559 m³ (stere).
[2] 1 gill=7.21875 cubic inches=4 fluid ounces=0.25 [¼] liquid pint=0.125 [⅛] liquid quart=0.03125 [1/32] gallon=0.118292 liter.
[3] 1 cubic millimeter=0.001 cm³=0.000061 cubic inch.
[4] 1 liter=volume pure water at 4° C. and 760 mm pressure weighing 1 kg=0.028378 bushel=0.001308 cubic yard.
[5] 1 cubic foot=0.80356 bushel=0.037037 cubic yard.
[6] The British imperial gallon=10 pounds distilled water at 62° F. (and barometer at 30 inches)= 277.418 cubic inches=1.20094 U. S. gallons=0.16054 cubic foot=4.545963 liters.
[7] 1 cubic centimeter=0.999973 milliliter (ml).
[8] The British imperial bushel=8 British gallons=2219.340 cubic inches=1.032050 United States bushels= 36.37 liters.
[9] 1 m³=1.308 cubic yards.

TABLE 4.—*Weight; unit conversion factors, with approximate values*

Grains [1]	Avoirdupois weight [2]			Troy and apothecaries' weight			Metric system		
	Drams	Ounces	Pounds	Drams	Ounces	Pounds	Milligrams	Grams	Kilograms
1	0.03657 (1/27)	0.002286	0.000143 [1/7000]	0.016667 [1/60]	0.002083 (1/500)	0.000174	64.7989 (65)	0.064799 (1/15)	---------
27.34375	1	0.0625 [1/16]	0.003906 (1/250)	0.45573 (1/2)	0.056966	0.004747 (1/210)	---------	1.771845	---------
437.5 (440)	16	[3] 1	0.0625 [1/16]	7.292	0.9115	0.075955 (1/13)	---------	28.34953 (28)	---------
7,000	256	16	1	116.667	14.5833 (14 1/2)	1.21528 (1 1/5)	---------	453.592 (450)	0.453592 (1/2)
60	2.194286 (2)	0.137143 (1/7)	0.008571	1	0.125 (1/8)	0.010417 (1/96)	---------	3.887935 (4)	---------
480	17.55429 (1)	1.09714	0.06857 (1/15)	8	1	0.083333 (1/12)	---------	31.10348 (31)	---------
5,760	210.651 (13)	13.1657	0.822857 (4/5)	96	12	1	---------	373.2418 (375)	0.373242 (2/5)
0.015432 (1/65)	0.000564	---------	---------	0.000257	---------	---------	[4] 1	0.001	---------
15.43236 (15)	0.564383	0.035274 (1/28)	0.002205	0.257206	0.032151 (1/30)	0.002679	1,000	1	0.001

	Hundred-weight			Short tons	Long tons		Milliers, tonnes, or metric tons		
	1	---------	100	0.05 [1/20]	0.045 (1/20)	---------	0.045359 (1/20)	---------	45.35924 (45)
	20	---------	2,000	1	0.89286 (9/10)	---------	0.90718 (9/10)	---------	907.1849 (900)
	22.4	---------	2,240	1.12 (1 1/10)	1	---------	1.01605 (1)	---------	1,016.05 (1,000)
	22.05	---------	2,204.62	1.10231 (1 1/10)	0.98420	---------	[5] 1	---------	1,000
15,432.4	0.022046 (35)	35.27396	2.204622 (2 1/5)	0.001102	0.000984	2.679228 (2 1/2)	0.001	1,000	1

[1] The grain is common to avoirdupois, troy, and apothecaries' systems.
[2] British units include 1 hundredweight (long, or one-twentieth long ton)=4 quarters=8 stone=112 pounds=50.8 kg; 1 stone=14 pounds=6.35 kg.
[3] 1 ounce (avoirdupois)=0.001 cubic foot of water at 16.7° C., or 62.06° F.
[4] 1 metric carat=200 mg=3.086471 grains.
[5] 1 tonne=10 quintals=100 myriagrams.

TABLE 5.—*Velocity; unit conversion factors, with approximate values*

Feet per minute	Feet per second	Miles per hour	Knots per hour	Meters per minute	Meters per second	Kilometers per hour
1	0.016667 [1/60]	0.011364 (1/100)	0.009868 (1/100)	0.304801 (1/3)	0.00508 (1/200)	0.018288 (1/55)
60	1	0.681818 (2/3)	0.592086 (3/5)	18.2880 (18)	0.304801 (1/3)	1.0973 (1.1)
88	1.46667 (1 1/2)	1	0.868393 (7/8)	26.8225 (27)	0.447041	1.60935 (1 3/5)
101.337 (100)	1.68894 (1 2/3)	1.15155 (1 1/7)	1	30.8875 (31)	0.514791 (1/2)	1.85325 (1 7/8)
3.28083 (3 1/4)	0.054681 (1/20)	0.037282 (1/27)	0.032376 (1/30)	1	0.016667 [1/60]	0.06 (1/17)
196.850 (200)	3.28083 (3 1/4)	2.236932 (2 1/4)	1.94253 (2)	60	1	3.6
54.6806 (55)	0.911343 (1)	0.621370 (5/8)	0.539593 (1/2)	16.6667 (17)	0.27778 (1/4)	1

TABLE 6.—*Power; unit conversion factors, with approximate values*

Foot-pounds per minute	Foot-pounds per second	Watts	Kilogram-meters per second	Force de cheval	Horse-power	Kilowatt
1	0.01667 (1/60)	0.0226 (1/45)	0.0023	----	----	----
60	1	1.35582 (1 1/3)	0.138255	0.00184	0.00182	----
44.2537 (45)	0.73756 (3/4)	[1] 1	0.101972 (1/10)	0.00136	0.00134	0.001
433.9799 (434)	7.23300	9.80665 (10)	1	0.01333	0.01315	0.0098
32,548.5	542.475	735.499	75	[2] 1	0.98632 (1)	0.7355 (3/4)
33,000	550	745.7 (750)	76.04	1.01387 (1)	1	0.7457 (3/4)
44,253.7 (45,000)	737.56	1,000	101.972 (100)	1.3596 (1 1/3)	1.341 (1 1/3)	1

[1] 1 watt=10⁷ ergs per second=1 joule per second.
[2] 1 force de cheval=1 metric horsepower.

TABLE 7.—*Weight as applied to length; unit conversion factors, with approximate values*

Grains per inch	Pounds per yard	Pounds per foot	Pounds per inch	Grams per meter	Grams per centimeter	Kilograms per meter
1	0.005143 (1/200)	----	----	2.551133 (2 1/2)	0.02551 (1/40)	----
194.444 (200)	1	0.333 (1/3)	0.027778 (1/36)	496.054 (500)	4.96054 (5)	0.496054 (1/2)
583.333 (600)	3	1	0.08333 (1/12)	1488.16 (1500)	14.8816 (15)	1.48816 (1 1/2)
7,000	36	12	1	----	178.579 (180)	17.8579 (18)
0.391983 (2/5)	0.002016	0.000672	0.000056	[1] 1	0.01 (1/100)	0.001 (1/1000)
39.198 (40)	0.201591 (1/5)	0.067197 (1/15)	0.005600 (1/200)	100	1	0.1
391.9826 (400)	2.015911 (2)	0.67197 (2/3)	0.055998	1,000	10	1

[1] 1 gram per meter=3.5480 pounds per mile=1 kilogram per kilometer.

TABLE 8.—*Weight or pressure as applied to area;*[1] *unit conversion factors, with approximate values*

Pounds per square foot	Pounds per square inch	Feet of water column or head [2]	Kilograms per square meter	Grams per square centimeter	Milli-meters of mercury column [3]	Atmos-pheres
1	0.006944 (1/144)	0.016018 (1/60)	4.88241 (5)	0.488241 (1/2)	----	0.000473
144	[4] 1	2.30664 5	703.067	70.3067 (70)	51.7134	0.068044 (1/15)
62.4283	0.433530	[5] 1	304.801	30.4801	22.4193 (22 1/2)	0.029499 (1/35)
0.204817 (1/5)	0.001422	0.003281	1	0.1	----	0.0000968 (1/10000)
2.04817 (2)	0.01422 (1/70)	0.03281	10	1	----	0.000968
2.784578 (2 3/4)	0.019337 (1/50)	0.044604	[6] 13.59545	1.359545 (1 1/3)	[7] 1	0.001316
2,116.28	14.6964 (14 7/10)	33.8993	10,332.54	1,033.254	760	[8] 1

[1] Pressure unit=1 barye=1 dyne per square centimeter=0.0010197 gram per square centimeter=0.010197 kilogram per square meter=(approximately) 0.000001 atmosphere. 1 megadyne=10⁶ dynes per square centimeter=0.98692 atmosphere.
[2] At 4° C., or 39.2° F.
[3] At 0° C., or 32° F. 1 inch of mercury column=70.728 pounds per square foot=1.132954 feet of water= 345.325 kilograms per square meter=25.40005 millimeters of mercury=0.033421 atmosphere.
[4] 1 pound per square inch=0.072 ton per square foot.
[5] 1 foot of water=0.882648 inch of mercury=0.304801 meter of water.
[6] The specific gravity of mercury at 0° C.
[7] 1 millimeter of mercury=0.03937 inch of mercury=0.013595 meter of water.
[8] 1 atmosphere=29.9212 inches of mercury=10.332542 meters of water.

TABLE 9.—*Weight as applied to volume; unit conversion factors, with approximate values*

Grains per cubic inch	Pounds per cubic yard	Pounds per bushel	Pounds per cubic foot	Pounds per gallon	Kilograms per cubic meter	Grams per cubic centimeter
1	----------	0.307203	0.246857 (¼)	0.0330 (1/30)	3.95425 (4)	0.003954 (1/250)
	1	----------	0.037037 [1/27]	----------	0.593273 (⅗)	0.000593
3.25518 (3¼)	----------	1	0.803564 (⅘)	0.107421 (1/10)	12.8718 (13)	0.012872
4.05093 (4)	27	1.24446 (1¼)	¹1	0.133681 (1/7)	16.0184 (16)	0.016018 (1/60)
30.3030 (30)	----------	9.3092 (9⅓)	7.48052 (7½)	²1	119.826 (120)	0.119826 (⅛)
	1.68556 (1⅔)	0.077689 (1/13)	0.062428 (1/16)	0.008345 (1/120)	1	0.001
252.893 (250)	1,685.56 (1,700)	77.6893 (80)	62.4283 (62½)	8.34545 (8)	1,000	³1

¹ 1 pound per cubic foot=1.60188 kilograms per hectoliter=0.0135 ton per cubic yard.
² 1 pound per gallon=0.1198 kilogram per liter.
³ 1 gram per cubic centimeter=1 tonne (metric ton) per cubic meter=(approximately) 1 kilogram per liter.

TABLE 10.—*Volume of various units of weight of water, with approximate values*

Unit of weight	Volume of various units of weight in—					
	Cubic centimeters	Cubic inches	Pints (liquid)	Quarts (liquid)	Liters	Gallons
1 grain	0.064799 (1/15)	0.003954 (1/250)	----------	----------	----------	----------
1 ounce	28.3495	1.72998 (1¾)	0.059913 (1/16)	0.029956 (1/32)	0.028349 (1/36)	0.007489
1 pound	453.592 (450)	27.6797	0.958606 (1)	0.479303 (½)	0.453580 (½)	0.119826 (⅛)
1 gram	1	0.061023 (1/16)	----------	----------	----------	----------
1 kilogram	1,000	61.0234 (60)	2.11336 (2)	1.05668 (1)	¹1	0.264170 (¼)
1 short ton	----------	----------	----------	----------	907.160	239.652 (240)
1 metric ton ²	----------	----------	----------	----------	¹1000	264.170

Unit of weight	Volume of various units of weight in—				
	Cubic feet	Bushels	Hectoliters	Cubic yards	Cubic meters
1 ounce	¹0.001	----------	----------	----------	----------
1 pound	0.016018 (1/60)	0.012872 (1/80)	----------	----------	----------
1 kilogram	0.035314 (1/28)	0.028377 (1/35)	¹0.01	0.001308	0.001
1 short ton	32.0367 (32)	25.7436 (26)	9.07160 (9)	1.18655 (1⅕)	0.907185 (.9)
1 metric ton ²	35.3145 (35)	28.3774 (28)	¹10	1.30794 (1⅓)	1

¹ Water has its greatest density at 4° C. and 760 millimeter pressure. At this density, 1 liter of water weighs 0.999973 kilogram. This value was used in the conversion here presented. For all practical forestry purposes, a liter of water can be considered as weighing 1 kilogram. Similarly, 0.001 cubic foot of water is considered as weighing 1 ounce. This density is attained at 16.7°C.
² Metric ton=1.1023112 short tons.

TABLE 11.—*Weight of various units of volume of water, with approximate values*

Unit of volume	Weight of various units of volume in—				
	Grains	Ounces	Pounds	Grams	Kilograms
1 cubic centimeter_____	15. 4324 (15½)	0. 035274 (⅓₀)	0. 002205	1	0. 001
1 cubic inch_____	252. 893 (250)	0. 578040 (⅗)	0. 036128 (⅓₀)	16. 3872 (16)	0. 016387 (⅟₆₀)
1 pint (liquid)_____	------------	16. 6909 (1)	1. 04318	------------	0. 473179 (½)
1 quart (liquid)_____	------------	33. 3818 (33)	2. 08636 (2)	------------	0. 946359 (1)
1 liter_____	------------	35. 2749 (35)	2. 20468 (2⅕)	[1] 1, 000	[1] 1
1 gallon_____	------------	133. 527 (135)	8. 34545 (8)	------------	3. 78543 (4)
	Short tons			Metric tons	
1 cubic foot_____	0. 031214 (⅟₃₂)	[2] 1, 000	62. 4283 (62½)	0. 028317 (⅟₃₅)	28. 3170 (28)
1 bushel_____	0. 038845 (⅟₂₁)	------------	77. 6893 (80)	0. 035239 (⅟₂₈)	35. 2393
1 hectoliter_____	0. 110234 (⅒)	------------	220. 468 (220)	[1] 0. 1	[1] 100
1 cubic yard_____	0. 842782 (⅘)	------------	1, 685. 56 (1, 700)	0. 764559	764. 559
1 cubic meter_____	[3] 1. 10231	------------	2, 204. 62 (2200)	1	1, 000

[1] A liter is, by definition, a unit of capacity equivalent to the volume occupied by the mass of a kilogram of pure water at its maximum density (4°C.) and under a pressure of 760 mm. It is actually equivalent in volume to 1.000027 cubic decimeters. In forestry measurements, however, 1 liter is considered as weighing 1 kilogram and having a volume of 1 cubic decimeter.
[2] In forestry measurements, the weight of 1 cubic foot is taken as 1,000 ounces. The absolute value is 998.853 ounces.
[3] Approximately 1 long ton.

TABLE 12.—*Rainfall per unit area; equivalent measurements*

Unit of rainfall	In cubic inches	In gallons	In cubic feet	In short tons	In liters	In metric tons
1 inch per acre_____	6, 272, 640	27, 154	3, 630	113. 3	102, 788. 0	102. 8
1 millimeter per hectare_____	610, 234	2, 642	353	11. 0	[1] 10, 000	10
1 millimeter per acre_____	246, 954	1, 069	143	4. 5	4, 076. 76	4. 0

[1] 9,999.73.

TABLE 13.—*Reservoir capacity, in equivalent measurements*

Acre-foot [1]	Gallons	Cubic feet	Cubic yards	Cubic meters
1	325, 851	43, 560	1, 613. 33	1, 233. 49

[1] The volume of a prism 1 foot high with a base of 1 acre.

TABLE 14.—*Discharge or flow of water; unit conversion factors, with approximate values.*

Cubic feet per minute	Gallons per second	Cubic feet per second (second-feet)	Gallons per day	Acre-feet per hour	Acre-feet per day	Miner's inch [1]	Liters per second	Cubic meters per second
1	0. 124675 (⅛)	0. 01667 [¹⁄₆₀]	10, 771. 92	0. 001377	0. 0330	0. 667 [⅔]	0. 471938 (½)	----------
8. 02083 (8)	1	0. 133681 (⅐)	86, 400. 0	0. 01105 (¹⁄₉₀)	0. 2652	----------	3. 78533 (3¾)	0. 003785 (¹⁄₂₅₀)
60	7. 48052 (7½)	1	646, 316. 93	[2] 0. 082645 (¹⁄₁₂)	1. 9835 (2)	40	28. 3163 (28)	0. 028317 (¹⁄₃₆)
726	90. 5143 (90)	12. 1 (12)	7, 820, 435. 52	1	24. 0	484 (500)	342. 627 (350)	0. 342636 (⅓)
30. 252 (30)	3. 7712 (3)	0. 5042 (½)	325, 828. 8	0. 0417	1	20. 168 (20)	14. 2740 (14)	0. 0143
1. 5 [1½]	0. 187013 (⅕)	0. 025 [¹⁄₄₀]	16, 157. 92	0. 002066	0. 0496	1	0. 707906	----------
2. 11892 (2)	0. 264178 (¼)	0. 035315 (¹⁄₃₀)	22, 824. 98	0. 002919	0. 0701	----------	1	[3] 0. 001
2, 118. 87 (2000)	264. 170 (265)	35. 3145 (35)	----------	2. 91855 (3)	0. 0452	----------	999. 973 (1000)	1

[1] Approximate values only; the miner's inch, used in many Western States to measure water flow, is the quantity of water that will pass through an orifice 1 square inch in cross-section under a given head, and varies from 1.36 to 1.73 cubic feet per minute. In California the legal standard is 1.5 cubic feet per minute, or the flow through an aperture 2 inches high in a 1.25-inch plank under a 6-inch head above the center of the stream.

[2] Or 1.98347 (approximately 2) acre-feet per day.

[3] See footnote 1, table 11.

TABLE 15.—*Approximate quantities of forest products represented by 1,000 feet of timber board measure (1 M feet b. m.)*

Product	Quantity	Product	Quantity
Shingles_____	10, 000	Fence posts_____	202
Lath_____	5, 000	Round timber (ratio, 6:1) cubic feet ____	166. 667
Hoops_____	3, 000	Sawed material (ratio, 12:1) cubic feet ___	83. 333
Slack staves_____	3, 000	Poles (telephone)_____	16. 667
Tight staves_____	1, 000	Steres (m³)_____	7. 25
Slack heading, sets_____	500	Cords_____	0. 5
Tight heading, sets_____	250		

TABLE 16.—*Approximate [1] equivalents of forest products*

Cubic feet	Board feet	Cords	Cubic meters (steres)
1_____	[2] 6	----------	0. 0283
200 [3]_____	1, 000	2	7. 25
90 [4]_____	500	1	2. 5
35_____	138	0. 25	1

[1] Most of these volumetric units are not capable of absolute conversion because of the character of the product and the manner of its utilization.

[2] The board foot per cubic foot ratio varies greatly, depending upon usage. Theoretically, 1 cubic foot contains 12 board feet. For average values 6 should be used, though 10 is a convenient figure for approximations. When the conversion applies to trees, ratios of 3 to 8 should be applied.

[3] The number of cubic feet of wood per thousand board feet varies as between softwoods and hardwoods. In softwoods, conversion factors vary from 160 to 220 cubic feet (working average about 183), and in hardwoods, from 220 to 250 (working average 242).

[4] Standard cord is 4 by 4 by 8 feet and contains 128 cubic feet gross volume (3.625m³). Because of methods of piling, character of material, etc., a cord of wood contains from 75 to 115 cubic feet. 90 cubic feet is taken as a rough conversion figure generally applicable.

Table 17.—*Areas of squares, length of one side being given* [1]

Length of each side of square			Area of square		
Feet	Meters	Chains	Square feet	Acres	Hectares
0. 66	0. 201	**0. 01**	0. 4356	0. 00001	------------
3. 28	**1**	. 050	10. 76	. 00025	0. 0001
6. 56	**2**	. 099	43. 06	. 00099	. 0004
6. 6	2. 012	. 1	43. 56	[2]. 001	. 0004
9. 84	**3**	. 149	96. 87	. 00222	. 0009
10	3. 048	. 152	100	. 00230	. 0009
13. 1	**4**	. 199	172. 22	. 00395	. 0016
13. 2	4. 023	**. 2**	174. 24	. 004	. 0016
15	4. 572	. 227	225	. 00517	. 0021
16. 4	**5**	. 249	269. 10	. 00618	. 0025
16. 5	5. 029	**. 25**	272. 25	. 00625	. 0025
19. 7	**6**	. 298	387. 50	. 00890	. 0036
19. 8	6. 035	**. 3**	392. 04	. 009	. 0036
20	6. 096	. 303	400	. 00918	. 0037
23. 0	**7**	. 348	527. 43	. 01211	. 0049
25	7. 620	. 379	625	. 01435	. 0058
26. 2	**8**	. 398	688. 89	. 01581	. 0064
26. 4	8. 047	**. 4**	696. 96	. 016	. 0065
29. 5	**9**	. 447	871. 87	. 02002	. 0081
30	9. 144	. 455	900	. 02066	. 0084
32. 8	**10**	. 497	1, 076. 39	. 02471	. 01
33	10. 058	**. 5**	1, 089	. 025	. 0101
35	10. 668	. 530	1, 225	. 02812	. 0114
39. 6	12. 070	**. 6**	1, 568. 16	. 036	. 0146
40	12. 192	. 606	1, 600	. 03673	. 0149
45	13. 716	. 682	2, 025	. 04649	. 0188
46. 2	14. 082	**. 7**	2, 134. 44	. 049	. 0198
49. 5	15. 088	**. 75**	2, 450. 25	. 05625	. 0228
50	15. 240	. 758	2, 500	. 05739	. 0232
52. 8	16. 093	**. 8**	2, 787. 84	. 064	. 0259
55	16. 764	. 833	3, 025	. 06944	. 0281
59. 4	18. 105	**. 9**	3, 528. 36	. 081	. 0328
65	19. 812	. 985	4, 225	. 09699	. 0393
65. 6	**20**	. 994	4, 305. 55	. 09884	. 04
66	20. 117	**1**	4, 356	. 1	. 0405
70	21. 336	1. 061	4, 900	. 11249	. 0455
75	22. 860	1. 136	5, 625	. 12913	. 0523
80	24. 384	1. 212	6, 400	. 14692	. 0595
82. 5	25. 146	**1. 25**	6, 806. 25	. 15625	. 0632
85	25. 908	1. 288	7, 225	. 16586	. 0671
90	27. 432	1. 364	8, 100	. 18595	. 0753
95	28. 956	1. 439	9, 025	. 20719	. 0838
98. 4	**30**	1. 491	9, 687. 48	. 22239	. 09
99	30. 175	**1. 5**	9, 801	. 225	. 0911
100	30. 480	1. 515	10, 000	. 22957	. 0929
104. 4	31. 808	1. 581	10, 890	**. 25**	. 1012
115. 5	35. 204	**1. 75**	13, 340. 25	. 30625	. 1239
131. 2	**40**	1. 988	17, 222. 19	. 39537	. 16
132	40. 234	**2**	17, 424	. 4	. 1619
147. 6	44. 983	2. 236	21, 780	**. 5**	. 2023
148. 5	45. 263	**2. 25**	22, 052. 25	. 50625	. 2049
164	**50**	2. 485	26, 909. 67	. 61776	. 25
165	50. 292	**2. 5**	27, 225	. 625	. 2529
196. 8	**60**	2. 983	38, 749. 92	. 88958	. 36
198	60. 351	**3**	39, 204	. 9	. 3642
200	60. 960	3. 030	40, 000	. 91827	. 3716
208. 7	63. 615	3. 162	43, 560	**1**	. 4047
229. 7	**70**	3. 480	52, 742. 95	1. 21081	. 49
231	70. 409	**3. 5**	53, 361	1. 225	. 4957
262. 5	**80**	3. 977	68, 888. 75	1. 58147	. 64
264	80. 467	**4**	69, 696	1. 6	. 6475
295. 3	**90**	4. 474	87, 187. 33	2. 00155	. 81
297	90. 526	**4. 5**	88, 209	2. 025	. 8195
328. 1	**100**	4. 971	107, 638. 7	2. 47104	1
330	100. 584	5	108, 900	2. 5	1. 0117

[1] The value in heavier type is that from which the corresponding values were computed. Continuing decimals or rounded values not shown in this table.
[2] 1 milacre.

TABLE 18.—*Basal area in square feet from given diameters of 0.1 to 60 inches* [1]

Diameter, inches	Area of circle	Diameter, inches	Area of circle	Diameter, inches	Area of circle	Diameter, inches	Area of circle
	Sq. ft.		*Sq. ft.*		*Sq. ft.*		*Sq. ft.*
0.1	0.0001	7.9	0.3404	15.7	1.3444	23.5	3.0121
0.2	.0002	8.	.3491	15.8	1.3616	23.6	3.0377
0.3	.0005−	8.1	.3578	15.9	1.3789	23.7	3.0635+
0.4	.0009	8.2	.3667	16.	1.3963	23.8	3.0895−
0.5	.0014	8.3	.3757	16.1	1.4138	23.9	3.1155−
0.6	.0020	8.4	.3848	16.2	1.4314	24.	3.1416
0.7	.0027	8.5	.3941	16.3	1.4491	24.1	3.1678
0.8	.0035−	8.6	.4034	16.4	1.4669	24.2	3.1942
0.9	.0044	8.7	.4128	16.5	1.4849	24.3	3.2206
1.	.0055−	8.8	.4224	16.6	1.5029	24.4	3.2472
1.1	.0066	8.9	.4320	16.7	1.5211	24.5	3.2739
1.2	.0079	9.	.4418	16.8	1.5394	24.6	3.3006
1.3	.0092	9.1	.4517	16.9	1.5578	24.7	3.3275+
1.4	.0107	9.2	.4616	17.	1.5763	24.8	3.3545+
1.5	.0123	9.3	.4717	17.1	1.5948	24.9	3.3816
1.6	.0140	9.4	.4819	17.2	1.6136	25.	3.4088
1.7	.0158	9.5	.4922	17.3	1.6324	25.1	3.4362
1.8	.0177	9.6	.5027	17.4	1.6513	25.2	3.4636
1.9	.0197	9.7	.5132	17.5	1.6703	25.3	3.4911
2.	.0218	9.8	.5238	17.6	1.6895−	25.4	3.5188
2.1	.0241	9.9	.5346	17.7	1.7087	25.5	3.5466
2.2	.0264	10.	.5454	17.8	1.7281	25.6	3.5744
2.3	.0289	10.1	.5564	17.9	1.7476	25.7	3.6024
2.4	.0314	10.2	.5675−	18.	1.7671	25.8	3.6305+
2.5	.0341	10.3	.5786	18.1	1.7868	25.9	3.6587
2.6	.0369	10.4	.5899	18.2	1.8066	26.	3.6870
2.7	.0398	10.5	.6013	18.3	1.8265+	26.1	3.7154
2.8	.0428	10.6	.6128	18.4	1.8466	26.2	3.7439
2.9	.0459	10.7	.6244	18.5	1.8667	26.3	3.7726
3.	.0491	10.8	.6362	18.6	1.8869	26.4	3.8013
3.1	.0524	10.9	.6480	18.7	1.9073	26.5	3.8302−
3.2	.0559	11.	.6600	18.8	1.9277	26.6	3.8591
3.3	.0594	11.1	.6720	18.9	1.9483	26.7	3.8882
3.4	.0631	11.2	.6842	19.	1.9689	26.8	3.9174
3.5	.0668	11.3	.6964	19.1	1.9897	26.9	3.9467
3.6	.0707	11.4	.7088	19.2	2.0106	27.	3.9761
3.7	.0747	11.5	.7213	19.3	2.0316	27.1	4.0056
3.8	.0788	11.6	.7339	19.4	2.0527	27.2	4.0352
3.9	.0830	11.7	.7466	19.5	2.0739	27.3	4.0649
4.	.0873	11.8	.7594	19.6	2.0953	27.4	4.0948
4.1	.0917	11.9	.7724	19.7	2.1167	27.5	4.1247
4.2	.0962	12.	.7854	19.8	2.1382	27.6	4.1548
4.3	.1008	12.1	.7985+	19.9	2.1599	27.7	4.1849
4.4	.1056	12.2	.8118	20.	2.1817	27.8	4.2152
4.5	.1104	12.3	.8252	20.1	2.2035+	27.9	4.2456
4.6	.1154	12.4	.8386	20.2	2.2255+	28.	4.2761
4.7	.1205−	12.5	.8522	20.3	2.2476	28.1	4.3067
4.8	.1257	12.6	.8659	20.4	2.2698	28.2	4.3374
4.9	.1310	12.7	.8797	20.5	2.2921	28.3	4.3682
5.	.1364	12.8	.8936	20.6	2.3145+	28.4	4.3991
5.1	.1419	12.9	.9076	20.7	2.3371	28.5	4.4301
5.2	.1475−	13.	.9218	20.8	2.3597	28.6	4.4613
5.3	.1532	13.1	.9360	20.9	2.3824	28.7	4.4925+
5.4	.1590	13.2	.9503	21.	2.4053	28.8	4.5239
5.5	.1650	13.3	.9648	21.1	2.4282	28.9	4.5554
5.6	.1710	13.4	.9793	21.2	2.4513	29.	4.5869
5.7	.1772	13.5	.9940	21.3	2.4745−	29.1	4.6186
5.8	.1835−	13.6	1.0088	21.4	2.4978	29.2	4.6504
5.9	.1899	13.7	1.0237	21.5	2.5212	29.3	4.6823
6.	.1963	13.8	1.0387	21.6	2.5447	29.4	4.7144
6.1	.2029	13.9	1.0538	21.7	2.5683	29.5	4.7465−
6.2	.2097	14.	1.0690	21.8	2.5920	29.6	4.7787
6.3	.2165−	14.1	1.0843	21.9	2.6159	29.7	4.8111
6.4	.2234	14.2	1.0998	22.	2.6398	29.8	4.8435+
6.5	.2304	14.3	1.1153	22.1	2.6639	29.9	4.8761
6.6	.2376	14.4	1.1310	22.2	2.6880	30.	4.9087
6.7	.2448	14.5	1.1467	22.3	2.7123	30.1	4.9415+
6.8	.2522	14.6	1.1626	22.4	2.7367	30.2	4.9744
6.9	.2597	14.7	1.1786	22.5	2.7612	30.3	5.0074
7.	.2673	14.8	1.1947	22.6	2.7858	30.4	5.0405+
7.1	.2749	14.9	1.2109	22.7	2.8105−	30.5	5.0737
7.2	.2827	15.	1.2272	22.8	2.8353	30.6	5.1071
7.3	.2907	15.1	1.2436	22.9	2.8602	30.7	5.1405−
7.4	.2987	15.2	1.2601	23.	2.8852	30.8	5.1740
7.5	.3068	15.3	1.2768	23.1	2.9104	30.9	5.2077
7.6	.3150	15.4	1.2935+	23.2	2.9356	31.	5.2414
7.7	.3234	15.5	1.3104	23.3	2.9610	31.1	5.2753
7.8	.3318	15.6	1.3273	23.4	2.9865−	31.2	5.3093

[1] $\pi=3.1415926536$; basal area in sq. ft. $=0.0054541539i$ (0.00545415i) times the square of the diameter in inches.

TABLE 18.—*Basal area in square feet from given diameters of 0.1 to 60 inches*—
Continued

Diameter, inches	Area of circle	Diameter, inches	Area of circle	Diameter, inches	Area of circle	Diameter, inches	Area of circle
	Sq. ft.		*Sq. ft.*		*Sq. ft.*		*Sq. ft.*
31.3	5.3434	38.5	8.0844	45.7	11.3909	52.9	15.2630
31.4	5.3776	38.6	8.1265—	45.8	11.4409	53	15.3207
31.5	5.4119	38.7	8.1686	45.9	11.4909	53.1	15.3786
31.6	5.4463	38.8	8.2109	46	11.5410	53.2	15.4366
31.7	5.4808	38.9	8.2533	46.1	11.5912	53.3	15.4947
31.8	5.5155—	39	8.2958	46.2	11.6416	53.4	15.5528
31.9	5.5502	39.1	8.3384	46.3	11.6920	53.5	15.6112
32	5.5851	39.2	8.3811	46.4	11.7426	53.6	15.6696
32.1	5.6200	39.3	8.4239	46.5	11.7932	53.7	15.7281
32.2	5.6551	39.4	8.4668	46.6	11.8440	53.8	15.7867
32.3	5.6903	39.5	8.5098	46.7	11.8949	53.9	15.8455—
32.4	5.7256	39.6	8.5530	46.8	11.9459	54	15.9043
32.5	5.7610	39.7	8.5962	46.9	11.9970	54.1	15.9633
32.6	5.7965—	39.8	8.6396	47	12.0482	54.2	16.0223
32.7	5.8321	39.9	8.6831	47.1	12.0995+	54.3	16.0815+
32.8	5.8678	40	8.7266	47.2	12.1510	54.4	16.1408
32.9	5.9036	40.1	8.7703	47.3	12.2025+	54.5	16.2002
33	5.9396	40.2	8.8141	47.4	12.2542	54.6	16.2597
33.1	5.9756	40.3	8.8580	47.5	12.3059	54.7	16.3193
33.2	6.0118	40.4	8.9021	47.6	12.3578	54.8	16.3790
33.3	6.0481	40.5	8.9462	47.7	12.4098	54.9	16.4389
33.4	6.0844	40.6	8.9904	47.8	12.4619	55	16.4988
33.5	6.1209	40.7	9.0348	47.9	12.5141	55.1	16.5589
33.6	6.1575+	40.8	9.0792	48	12.5664	55.2	16.6190
33.7	6.1942	40.9	9.1238	48.1	12.6188	55.3	16.6793
33.8	6.2310	41	9.1684	48.2	12.6713	55.4	16.7397
33.9	6.2680	41.1	9.2132	48.3	12.7239	55.5	16.8002
34	6.3050	41.2	9.2581	48.4	12.7767	55.6	16.8608
34.1	6.3421	41.3	9.3031	48.5	12.8295+	55.7	16.9215—
34.2	6.3794	41.4	9.3482	48.6	12.8825—	55.8	16.9823
34.3	6.4168	41.5	9.3934	48.7	12.9356	55.9	17.0432
34.4	6.4542	41.6	9.4387	48.8	12.9887	56	17.1042
34.5	6.4918	41.7	9.4842	48.9	13.0420	56.1	17.1654
34.6	6.5295—	41.8	9.5297	49	13.0954	56.2	17.2266
34.7	6.5673	41.9	9.5754	49.1	13.1489	56.3	17.2880
34.8	6.6052	42	9.6211	49.2	13.2025+	56.4	17.3494
34.9	6.6432	42.1	9.6670	49.3	13.2563	56.5	17.4110
35	6.6813	42.2	9.7130	49.4	13.3101	56.6	17.4727
35.1	6.7196	42.3	9.7591	49.5	13.3640	56.7	17.5345+
35.2	6.7579	42.4	9.8053	49.6	13.4181	56.8	17.5964
35.3	6.7964	42.5	9.8516	49.7	13.4723	56.9	17.6584
35.4	6.8349	42.6	9.8980	49.8	13.5265+	57	17.7205+
35.5	6.8736	42.7	9.9445+	49.9	13.5809	57.1	17.7828
35.6	6.9124	42.8	9.9911	50	13.6354	57.2	17.8451
35.7	6.9513	42.9	10.0379	50.1	13.6900	57.3	17.9076
35.8	6.9903	43	10.0847	50.2	13.7447	57.4	17.9701
35.9	7.0294	43.1	10.1317	50.3	13.7995+	57.5	18.0328
36	7.0686	43.2	10.1788	50.4	13.8544	57.6	18.0956
36.1	7.1079	43.3	10.2259	50.5	13.9095—	57.7	18.1585—
36.2	7.1473	43.4	10.2732	50.6	13.9646	57.8	18.2215—
36.3	7.1869	43.5	10.3206	50.7	14.0199	57.9	18.2846
36.4	7.2265+	43.6	10.3681	50.8	14.0752	58	18.3478
36.5	7.2663	43.7	10.4157	50.9	14.1307	58.1	18.4111
36.6	7.3062	43.8	10.4635—	51	14.1863	58.2	18.4745+
36.7	7.3461	43.9	10.5113	51.1	14.2419	58.3	18.5381
36.8	7.3862	44	10.5592	51.2	14.2977	58.4	18.6017
36.9	7.4264	44.1	10.6073	51.3	14.3536	58.5	18.6655—
37	7.4667	44.2	10.6555—	51.4	14.4097	58.6	18.7293
37.1	7.5072	44.3	10.7037	51.5	14.4658	58.7	18.7933
37.2	7.5477	44.4	10.7521	51.6	14.5220	58.8	18.8574
37.3	7.5883	44.5	10.8006	51.7	14.5784	58.9	18.9216
37.4	7.6291	44.6	10.8492	51.8	14.6348	59	18.9859
37.5	7.6699	44.7	10.8979	51.9	14.6914	59.1	19.0503
37.6	7.7109	44.8	10.9467	52	14.7480	59.2	19.1148
37.7	7.7519	44.9	10.9956	52.1	14.8048	59.3	19.1795—
37.8	7.7931	45	11.0447	52.2	14.8617	59.4	19.2442
37.9	7.8344	45.1	11.0938	52.3	14.9187	59.5	19.3091
38	7.8758	45.2	11.1431	52.4	14.9758	59.6	19.3740
38.1	7.9173	45.3	11.1924	52.5	15.0330	59.7	19.4391
38.2	7.9589	45.4	11.2419	52.6	15.0903	59.8	19.5043
38.3	8.0006	45.5	11.2915—	52.7	15.1478	59.9	19.5696
38.4	8.0425—	45.6	11.3411	52.8	15.2053	60	19.6350

TABLE 19.—*Area of large circles and squares*

Radius of circles		Side of squares		Area in square feet	Area in acres
Feet	*Inches*	*Feet*	*Inches*		
3	9	6	7	43. 6	**0. 001**
5		8	10	78. 5	. 0018
5	7½	**10**		**100**	. 0023
6		10	8	113. 1	. 0026
7	6	13	4	176. 7	. 0041
8		14	2	201. 1	. 0046
10		17	8	314. 2	. 0072
11	3½	**20**		**400**	. 0092
11	9½	20	11	436	**. 010**
12	6	22	2	491	. 011
12	7½	22	4	**500**	. 011
15		26	7	707	. 016
17	10	31	7	**1000**	. 023
18	7½	33		1089	**. 025**
25		44	4	1963	. 045
26	4	46	8	2178	**. 05**
28	2½	**50**		**2500**	. 057
30		53	2	2827	. 065
30	11	54	9	3000	. 069
32	3	57	2	3267	**. 075**
33		58	6	3421	. 079
35	8	63	3	**4000**	. 092
37	3	66		4356	**. 1**
37	6	66	6	4418	. 101
39	10½	70	8	**5000**	. 115
50		88	7	7854	. 180
52	8	93	4	8712	**. 2**
58	10½	104	5	10890	**. 25**
64	6	114	4	13068	**. 3**
66		116	11	13685	. 31
68		120	6	14520	**. 33⅓**
69	1	122	6	**15000**	. 34
74	5½	132		17424	**. 4**
79	9½	141	5	**20000**	. 46
83	3	147	7	21780	**. 5**
101	11½	180	9	32670	**. 75**
117	9	208	8	**43560**	**1. 0**

TABLE 20.—*Number of trees per acre by various methods of spacing*

Spacing (feet)	Trees	Spacing (feet)	Trees	Spacing (feet)	Trees
	Number		*Number*		*Number*
2×2	10, 890	7×9	691	12×15	242
3×3	4, 840	7×10	622	12×18	202
4×4	2, 722	7×12	519	12×20	182
4×5	2, 178	7×15	415	12×25	145
4×6	1, 815	8×8	681	13×13	258
4×7	1, 555	8×9	605	13×15	223
4×8	1, 361	8×10	544	13×20	168
4×9	1, 210	8×12	454	13×25	134
4×10	1, 089	8×15	363	14×14	222
5×5	1, 742	8×25	218	14×15	207
5×6	1, 452	9×9	538	14×20	156
5×7	1, 245	9×10	484	14×25	124
5×8	1, 089	9×12	403	15×15	194
5×9	968	9×15	323	15×20	145
5×10	871	10×10	436	15×25	116
6×6	1, 210	10×12	363	16×16	170
6×7	1, 037	10×15	290	16×20	136
6×8	908	10×18	242	16×25	109
6×9	807	11×11	360	18×18	134
6×10	726	11×12	330	18×20	121
6×12	605	11×15	264	18×25	97
6×15	484	11×20	198	20×20	109
7×7	889	11×25	158	20×25	87
7×8	778	12×12	302	25×25	70

TABLE 21.—*Grade percent and equivalent degree of slope*

Grade (Percent)	Slope in degrees		Grade (Percent)	Slope in degrees		Grade (Percent)	Slope in degrees		Grade (Percent)	Slope in degrees	
	°	′		°	′		°	′		°	′
1	0	34.4	11	6	16.6	21	11	51.6	55	28	48.6
2	1	8.7	12	6	50.6	22	12	24.4	60	30	57.8
3	1	43.1	13	7	24.4	23	12	57.2	65	33	1.4
4	2	17.4	14	7	58.2	24	13	29.7	70	34	59.5
5	2	51.7	15	8	31.8	25	14	2.2	75	36	52.2
6	3	26.0	16	9	5.4	30	16	42.0	80	38	39.6
7	4	0.3	17	9	38.9	35	19	17.4	85	40	21.9
8	4	34.4	18	10	12.2	40	21	48.1	90	41	59.2
9	5	8.6	19	10	45.5	45	24	13.7	95	43	31.9
10	5	42.6	20	11	18.6	50	26	33.9	100	45	0

[1] Equivalents of customary expressions of grade are as follows:
Grades and slopes: 1 foot per chain=1.515 percent; 1 foot per mile=0.018939 percent; 1 millimeter per meter=0.1 percent; 1 foot per thousand=0.1 percent; 1-percent grade=633.6 inches per mile=52.8 feet per mile=10 millimeters per meter=10 feet per thousand feet=1 foot per 1.515 chains=0.66 feet per chain.

TABLE 22.—*Degree of slope and equivalent grade percent*

Degree of slope		Grade	Degree of slope		Grade	Degree of slope		Grade	Degree of slope		Grade
°	′	*Percent*	°	′	*Percent*	°	′	*Percent*	°	′	*Percent*
0	30	0.873	5		8.749	9	30	16.734	18		32.492
1		1.746	5	30	9.629	10		17.633	19		34.433
1	30	2.619	6		10.510	11		19.438	20		36.397
2		3.492	6	30	11.394	12		21.256	22	30	41.421
2	30	4.366	7		12.278	13		23.087	25		46.631
3		5.241	7	30	13.165	14		24.933	30		57.735
3	30	6.116	8		14.054	15		26.795	35		70.021
4		6.993	8	30	14.945	16		28.675	40		83.910
4	30	7.870	9		15.838	17		30.573	45		100.0

TABLE 23.—*Scale of velocity equivalents of the Beaufort scale of wind*

Beaufort scale no.	Description	Indicators of velocity	Velocity	
			Meters per second	Miles per hour
0	Calm	Calm air; smoke rises vertically	Less than 0.3	Less than 1.
1	Light air	Direction of wind shown by smoke drift, but not by wind vanes.	0.3 to 1.5	1 to 3.
2	Slight breeze	Wind felt on face; leaves rustle; ordinary vane moved by wind.	1.6 to 3.3	4 to 7.
3	Gentle breeze	Leaves and small twigs in constant motion; wind extends light flag.	3.4 to 5.4	8 to 12.
4	Moderate breeze	Raises dust and loose paper; small branches are moved.	5.5 to 7.9	13 to 18.
5	Fresh breeze	Small trees in leaf sway; crested wavelets form on inland waters.	8.0 to 10.7	19 to 24.
6	Strong breeze	Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.	10.8 to 13.8	25 to 31.
7	High wind	Whole trees in motion; inconvenience felt when walking against wind.	13.9 to 17.1	32 to 38.
8	Gale	Breaks twigs off trees; wind generally impedes progress.	17.2 to 20.7	39 to 46.
9	Strong gale	Slight structural damage occurs to signs; branches broken.	20.8 to 24.4	47 to 54.
10	Whole gale	Trees uprooted or broken; considerable structural damage occurs.	24.5 to 28.4	55 to 63.
11	Storm	Very rarely experienced; accompanied by widespread damage; forests windthrown or broken off.	28.5 to 33.5	64 to 75.
12	Hurricane		33.6 or above	Above 75.

TABLE 24.—*Relative humidity percent, pressure 29.0 inches, Fahrenheit temperatures*

Dry-bulb temperature °F.	Depression of wet bulb (dry-bulb temperature minus wet-bulb temperature)																	
	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
40	46	38	31	23	16	9	2											
42	48	41	34	28	21	14	7	0										
44	51	44	37	31	24	18	12	5										
46	53	46	40	34	28	22	16	10	4									
48	54	48	42	36	31	25	19	14	8	3								
50	56	50	44	39	33	28	22	17	12	7	2							
52	58	52	46	41	36	30	25	20	15	10	6	0						
54	59	54	48	43	38	33	28	23	18	14	9	5	0					
56	61	55	50	45	40	35	31	26	21	17	12	8	4					
58	62	57	52	47	42	38	33	28	24	20	15	11	7	3				
60	63	58	53	49	44	40	35	31	27	22	18	14	10	6	2			
62	64	60	55	50	46	41	37	33	29	25	21	17	13	9	6	2		
64	66	61	56	52	48	43	39	35	31	27	23	20	16	12	9	5	2	
66	66	62	58	53	49	45	41	37	33	29	26	22	18	15	11	8	5	1
68	67	63	59	55	51	47	43	39	35	31	28	24	21	17	14	11	8	4
70	68	64	60	56	52	48	44	40	37	33	30	26	23	20	17	13	10	7
72	69	65	61	57	53	49	46	42	39	35	32	28	25	22	19	16	13	10
74	70	66	62	58	54	51	47	44	40	37	34	30	27	24	21	18	15	12
76	70	67	63	59	55	52	48	45	42	38	35	32	29	26	23	20	17	14
78	71	67	64	60	57	53	50	46	43	40	37	34	31	28	25	22	19	16
80	72	68	64	61	57	54	51	47	44	41	38	35	32	29	27	24	21	18
82	72	69	65	62	58	55	52	49	46	43	40	37	34	31	28	25	23	20
84	73	70	66	63	59	56	53	50	47	44	41	38	35	32	30	27	25	22
86	74	70	67	63	60	57	54	51	48	45	42	39	37	34	31	29	26	24
88	74	71	67	64	61	58	55	52	49	46	43	41	38	35	33	30	28	25
90	75	71	68	65	62	59	56	53	50	47	44	42	39	37	34	32	29	27
92	75	72	69	65	62	59	57	54	51	48	45	43	40	38	35	33	30	28
94	75	72	69	66	63	60	57	54	52	49	46	44	41	39	36	34	32	29
96	76	73	70	67	64	61	58	55	53	50	47	45	42	40	37	35	33	31
98	76	73	70	67	64	61	59	56	53	51	48	46	43	41	39	36	34	32
100	77	74	71	68	65	62	59	57	54	52	49	47	44	42	40	37	35	33
102	77	74	71	68	65	63	60	57	55	52	50	47	45	43	41	38	36	34
104	77	74	72	69	66	63	61	58	56	53	51	48	46	44	41	39	37	35
106	78	75	72	69	66	64	61	59	56	54	51	49	47	45	42	40	38	36
108	78	75	72	70	67	64	62	59	57	54	52	50	47	45	43	41	39	37

Dry-bulb temperature °F.	Depression of wet bulb (dry-bulb temperature minus wet-bulb temperature)																	
	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42
68	1																	
70	4	1																
72	7	4	1															
74	9	7	4	1														
76	12	9	6	4	1													
78	14	11	9	6	4	1												
80	16	13	11	8	6	4	1											
82	18	15	13	10	8	6	4	1										
84	20	17	15	12	10	8	6	4	2									
86	21	19	17	14	12	10	8	6	4	2								
88	23	21	18	16	14	12	10	8	6	4	2							
90	24	22	20	18	16	14	12	10	8	6	4	2	0					
92	26	24	22	19	17	15	13	11	9	8	6	4	2	0				
94	27	25	23	21	19	17	15	13	11	9	8	6	4	2	1			
96	29	26	24	22	20	18	17	15	13	11	9	7	6	4	3	1		
98	30	28	26	24	22	20	18	16	14	13	11	9	7	6	4	3	1	
100	31	29	27	25	23	21	19	18	16	14	12	11	9	7	6	4	3	1
102	32	30	28	26	24	22	20	19	17	15	14	12	11	9	7	6	4	3
104	33	31	29	27	25	24	22	20	18	17	15	14	12	10	9	7	6	5
106	34	32	30	28	26	25	23	21	19	18	16	15	13	12	10	9	7	6
108	35	33	31	29	28	26	24	22	21	19	18	16	15	13	12	10	9	7
110	36	34	32	30	29	27	25	24	22	20	19	17	16	14	13	11	10	9
112	37	35	33	31	30	28	26	25	23	21	20	18	17	15	14	13	11	10
114	38	36	34	32	31	29	27	26	24	22	21	19	18	17	15	14	13	11
116	38	37	35	33	31	30	28	27	25	23	22	20	19	18	16	15	14	12
118	39	37	36	34	32	31	29	27	26	24	23	21	20	19	17	16	15	13

TABLE 25.—*Quarter girth;*[1] *equivalents in true girth, diameter, area, and volume, United States measurement and metric system*

Quarter girth unit	United States measurement	Metric system
1 inch_____	{In true girth=4 inches_____ {In diameter=1.2732 inches_____	In true girth=10.16 cm. In diameter=3.234 cm.
1 square foot per acre_____	=1.2732 square feet per acre_____	{=0.118288 m² per acre. {=0.29230 m² per hectare.
1 cubic foot per acre_____	=1.2732 cubic feet per acre_____	{=0.036054 m³ per acre. {=0.089092 m³ per hectare.

[1] A British unit used customarily in East Indian forestry, equivalent to about 1¼ diameters. The converting factor from diameter to quarter girth would be $\frac{\pi}{4}$ or 0.7854.

TABLE 26.—*Natural trigonometric functions, by half degrees*

Degree		Sin	Cos	Tan	Degree		Sin	Cos	Tan	Degree		Sin	Cos	Tan
°	′				°	′				°	′			
0	30	0.0087	1.0000	0.0087	15	30	0.2672	0.9636	0.2773	30	30	0.5075	0.8616	0.5890
1		.0175	.9998	.0175	16		.2756	.9613	.2867	31		.5150	.8572	.6009
1	30	.0262	.9997	.0262	16	30	.2840	.9588	.2962	31	30	.5225	.8526	.6128
2		.0349	.9994	.0349	17		.2924	.9563	.3057	32		.5299	.8480	.6249
2	30	.0436	.9990	.0437	17	30	.3007	.9537	.3153	32	30	.5373	.8434	.6371
3		.0523	.9986	.0524	18		.3090	.9511	.3249	33		.5446	.8387	.6494
3	30	.0610	.9981	.0612	18	30	.3173	.9483	.3346	33	30	.5519	.8339	.6619
4		.0698	.9976	.0699	19		.3256	.9455	.3443	34		.5592	.8290	.6745
4	30	.0785	.9969	.0787	19	30	.3338	.9426	.3541	34	30	.5664	.8241	.6873
5		.0872	.9962	.0875	20		.3420	.9397	.3640	35		.5736	.8192	.7002
5	30	.0958	.9954	.0963	20	30	.3502	.9367	.3739	35	30	.5807	.8141	.7133
6		.1045	.9945	.1051	21		.3584	.9336	.3839	36		.5878	.8090	.7265
6	30	.1132	.9936	.1139	21	30	.3665	.9304	.3939	36	30	.5948	.8039	.7400
7		.1219	.9925	.1228	22		.3746	.9272	.4040	37		.6018	.7986	.7536
7	30	.1305	.9914	.1317	22	30	.3827	.9239	.4142	37	30	.6088	.7934	.7673
8		.1392	.9903	.1405	23		.3907	.9205	.4245	38		.6157	.7880	.7813
8	30	.1478	.9890	.1495	23	30	.3987	.9171	.4348	38	30	.6225	.7826	.7954
9		.1564	.9877	.1584	24		.4067	.9135	.4452	39		.6293	.7771	.8098
9	30	.1650	.9863	.1673	24	30	.4147	.9100	.4557	39	30	.6361	.7716	.8243
10		.1736	.9848	.1763	25		.4226	.9063	.4663	40		.6428	.7660	.8391
10	30	.1822	.9833	.1853	25	30	.4305	.9026	.4770	40	30	.6494	.7604	.8541
11		.1908	.9816	.1944	26		.4384	.8988	.4877	41		.6561	.7547	.8693
11	30	.1994	.9799	.2035	26	30	.4462	.8949	.4986	41	30	.6626	.7490	.8847
12		.2079	.9781	.2126	27		.4540	.8910	.5095	42		.6691	.7431	.9004
12	30	.2164	.9763	.2217	27	30	.4617	.8870	.5206	42	30	.6756	.7373	.9163
13		.2250	.9744	.2309	28		.4695	.8829	.5317	43		.6820	.7314	.9325
13	30	.2334	.9724	.2401	28	30	.4772	.8788	.5430	43	30	.6884	.7254	.9490
14		.2419	.9703	.2493	29		.4848	.8746	.5543	44		.6947	.7193	.9657
14	30	.2504	.9681	.2586	29	30	.4924	.8704	.5658	44	30	.7009	.7133	.9827
15		.2588	.9659	.2679	30		.5000	.8660	.5774	45		.7071	.7071	1.0000

TABLE 27.—*The International log rule*

[Saw kerf ¼ inch] [1]

Diameter (inches)	Volume in board feet of logs of indicated length in feet							Diameter, inches
	8	10	12	14	16	18	20	
4		5	5	5	5	5	10	4
5	5	5	10	10	10	15	15	5
6	10	10	15	15	20	25	.25	6
7	10	15	20	25	30	35	40	7
8	15	20	25	35	40	45	50	8
9	20	30	35	45	50	60	70	9
10	30	35	45	55	65	75	85	10
11	35	45	55	70	80	95	105	11
12	45	55	70	85	95	110	125	12
13	55	70	85	100	115	135	150	13
14	65	80	100	115	135	155	175	14
15	75	95	115	135	160	180	205	15
16	85	110	130	155	180	205	235	16
17	95	125	150	180	205	235	265	17
18	110	140	170	200	230	265	300	18
19	125	155	190	225	260	300	335	19
20	135	175	210	250	290	330	370	20
21	155	195	235	280	320	365	410	21
22	170	215	260	305	355	405	455	22
23	185	235	285	335	390	445	495	23
24	205	255	310	370	425	485	545	24
25	220	280	340	400	460	525	590	25
26	240	305	370	435	500	570	640	26
27	260	330	400	470	540	615	690	27
28	280	355	430	510	585	665	745	28
29	305	385	465	545	630	715	800	29
30	325	410	495	585	675	765	860	30
31	350	440	530	625	720	820	915	31
32	375	470	570	670	770	875	980	32
33	400	500	605	715	820	930	1045	33
34	425	535	645	760	875	990	1110	34
35	450	565	685	805	925	1050	1175	35
36	475	600	725	855	980	1115	1245	36
37	505	635	770	905	1040	1175	1315	37
38	535	670	810	955	1095	1245	1390	38
39	565	710	855	1005	1155	1310	1465	39
40	595	750	900	1060	1220	1380	1540	40
41	625	785	950	1115	1280	1450	1620	41
42	655	825	995	1170	1345	1525	1705	42
43	690	870	1045	1230	1410	1600	1785	43
44	725	910	1095	1290	1480	1675	1870	44
45	755	955	1150	1350	1550	1755	1960	45
46	795	995	1200	1410	1620	1835	2050	46
47	830	1040	1255	1475	1695	1915	2140	47
48	865	1090	1310	1540	1770	2000	2235	48
49	905	1135	1370	1605	1845	2085	2330	49
50	940	1185	1425	1675	1920	2175	2425	50
51	980	1235	1485	1745	2000	2265	2525	51
52	1020	1285	1545	1815	2080	2355	2625	52
53	1060	1335	1605	1885	2165	2445	2730	53
54	1100	1385	1670	1960	2245	2540	2835	54
55	1145	1440	1735	2035	2330	2640	2945	55
56	1190	1495	1800	2110	2420	2735	3050	56
57	1230	1550	1865	2185	2510	2835	3165	57
58	1275	1605	1930	2265	2600	2935	3275	58
59	1320	1660	2000	2345	2690	3040	3390	59
60	1370	1720	2070	2425	2785	3145	3510	60

[1] Scale for seasoned lumber with 1/16-inch shrinkage per 1-inch board, and saws cutting a ¼-inch kerf, or for green lumber, for saws cutting a 5/16-inch kerf. For saws cutting a 1/8-inch kerf add 10.5 percent.
Formula: $((D^2 \times 0.22) - 0.71D) \times 0.904762$ for 4-foot sections.
Taper allowance: ½ inch per 4 feet lineal.

NOTE.—The International log rule gives consistent results under good milling practice. It is the most fair rule for all classes of timber and logs and should be used for second-growth material particularly. For this reason the International volume tables are recommended.

TABLE 28.—*Scribner decimal C log rule*

[In tens—i. e., 0 omitted]

Diameter (inches)	Contents in board feet of logs of length indicated in feet									
	6	8	10	12	14	16	18	20	22	24
6	0.5	0.5	1	1	1	2	2	2	3	3
7	.5	1	1	2	2	3	3	3	4	4
8	1	1	2	2	2	3	3	3	4	4
9	1	2	3	3	3	4	4	4	5	6
10	2	3	3	3	4	6	6	7	8	9
11	2	3	4	4	5	7	8	8	9	10
12	3	4	5	6	7	8	9	10	11	12
13	4	5	6	7	8	10	11	12	13	15
14	4	6	7	9	10	11	13	14	16	17
15	5	7	9	11	12	14	16	18	20	21
16	6	8	10	12	14	16	18	20	22	24
17	7	9	12	14	16	18	21	23	25	28
18	8	11	13	16	19	21	24	27	29	32
19	9	12	15	18	21	24	27	30	33	36
20	11	14	17	21	24	28	31	35	38	42
21	12	15	19	23	27	30	34	38	42	46
22	13	17	21	25	29	33	38	42	46	50
23	14	19	23	28	33	38	42	47	52	57
24	15	21	25	30	35	40	45	50	55	61
25	17	23	29	34	40	46	52	57	63	69
26	19	25	31	37	44	50	56	62	69	75
27	21	27	34	41	48	55	62	68	75	82
28	22	29	36	44	51	58	65	73	80	87
29	23	31	38	46	53	61	68	76	84	91
30	25	33	41	49	57	66	74	82	90	99
31	27	36	44	53	62	71	80	89	98	106
32	28	37	46	55	64	74	83	92	101	110
33	29	39	49	59	69	78	88	98	108	118
34	30	40	50	60	70	80	90	100	110	120
35	33	44	55	66	77	88	98	109	120	131
36	35	46	58	69	81	92	104	115	127	138
37	39	51	64	77	90	103	116	129	142	154
38	40	54	67	80	93	107	120	133	147	160
39	42	56	70	84	98	112	126	140	154	168
40	45	60	75	90	105	120	135	150	166	181
41	48	64	79	95	111	127	143	159	175	191
42	50	67	84	101	117	134	151	168	185	201
43	52	70	87	105	122	140	157	174	192	209
44	56	74	93	111	129	148	166	185	204	222
45	57	76	95	114	133	152	171	190	209	228
46	59	79	99	119	139	159	178	198	218	238
47	62	83	104	124	145	166	186	207	228	248
48	65	86	108	130	151	173	194	216	238	260
49	67	90	112	135	157	180	202	225	247	270
50	70	94	117	140	164	187	211	234	257	281
51	73	97	122	146	170	195	219	243	268	292
52	76	101	127	152	177	202	228	253	278	304
53	79	105	132	158	184	210	237	263	289	316
54	82	109	137	164	191	218	246	273	300	328
55	85	113	142	170	198	227	255	283	312	340
56	88	118	147	176	206	235	264	294	323	353
57	91	122	152	183	213	244	274	304	335	365
58	95	126	158	189	221	252	284	315	347	379
59	98	131	163	196	229	261	294	327	359	392
60	101	135	169	203	237	270	304	338	372	406

Diameter given is for the small end of the log measured inside bark.

TABLE 29.—*Solid cubic contents of logs*

Length (feet)	Contents in cubic feet for average middle diameter of log in inches indicated																	
	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
4	0.25	0.25	0.5	1	1	1	2	2	3	3	4	4	5	6	6	7	8	9
5	.25	.5	.5	1	1	2	2	3	3	4	5	5	6	7	8	9	10	11
6	.25	.5	.5	1	2	2	3	3	4	5	5	6	7	8	9	11	12	13
7	.25	.5	1	1	2	2	3	4	5	5	6	7	9	10	11	12	14	15
8	.5	.5	1	2	2	2	3	4	5	6	7	9	10	11	13	14	16	17
9	.5	1	1	2	2	3	4	5	6	7	8	10	11	13	14	16	18	20
10	.5	1	1	2	3	3	4	5	7	8	9	11	12	14	16	18	20	22
11	.5	1	1	2	3	3	4	6	7	9	10	12	13	15	17	19	22	24
12	.5	1	2	2	3	3	4	6	7	8	9	11	13	15	17	19	21	24	26
13	.5	1	2	2	3	5	6	7	9	10	12	14	16	18	20	23	26	28
14	.5	1	2	2	4	5	6	8	9	11	13	15	17	20	22	25	28	31
15	.5	1	2	2	4	5	7	8	10	12	14	16	18	21	24	27	30	33
16	1	1	2	3	4	6	7	9	11	13	15	17	20	22	25	28	32	35
17	1	1	2	3	5	6	8	9	11	14	17	18	21	24	27	30	33	37
18	1	2	2	4	5	6	8	10	12	14	17	20	23	25	28	32	35	39
19	1	2	3	4	5	7	8	10	13	15	18	20	23	27	30	34	37	41
20	1	2	3	4	5	7	9	11	13	16	18	21	25	28	32	35	39	44
21	1	2	3	4	6	7	9	11	14	16	19	22	26	29	33	37	41	46
22	1	2	3	4	6	8	10	12	15	17	20	24	27	31	35	39	43	48
23	1	2	3	5	6	8	10	13	15	18	21	25	28	32	36	41	45	50
24	1	2	3	5	6	8	11	13	16	19	22	26	29	34	38	42	47	52
25	1	2	3	5	7	9	11	14	16	20	23	27	31	35	39	44	49	55
26				5	7	9	11	14	17	20	24	28	32	36	41	46	51	57
27				5	7	9	12	15	18	21	25	29	33	38	43	48	53	59
28				5	7	10	12	15	18	22	26	30	34	39	44	49	55	61
29				6	8	10	13	16	19	23	27	31	36	40	46	51	57	63
30				6	8	10	13	16	20	24	28	32	37	42	47	53	59	65
31				6	8	11	14	17	20	24	29	33	38	43	49	55	61	68
32				6	9	11	14	17	21	25	29	34	39	45	50	57	63	70

Length (feet)	Contents in cubic feet for average middle diameter of log in inches indicated																			
	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
4	10	11	12	13	14	15	16	17	18	20	21	22	24	25	27	28	30	32	33	35
5	12	13	14	16	17	18	20	21	23	25	26	28	30	32	33	35	37	39	41	44
6	14	16	17	19	20	22	24	26	28	29	31	34	36	38	40	42	45	47	50	52
7	17	18	20	22	24	26	28	30	32	34	37	39	42	44	47	49	52	55	58	61
8	19	21	23	25	27	29	32	34	37	39	42	45	48	50	53	57	60	63	66	70
9	22	24	26	28	31	33	36	38	41	44	47	50	53	57	60	64	67	71	75	79
10	24	26	29	31	34	37	40	43	46	49	52	56	59	63	67	71	75	79	83	87
11	26	29	32	35	37	41	44	47	50	54	58	61	65	69	73	78	82	87	91	96
12	29	32	35	38	41	44	48	51	55	59	63	67	71	76	80	85	90	95	100	105
13	31	34	38	41	44	48	52	56	60	64	68	73	77	82	87	92	97	102	108	113
14	34	37	40	44	48	52	56	60	64	69	73	78	83	88	94	99	105	110	116	122
15	36	40	43	47	51	55	60	64	69	74	79	84	89	95	100	106	112	118	124	131
16	38	42	46	50	55	59	64	68	73	79	84	89	95	101	107	113	119	126	133	140
17	41	45	49	53	58	63	68	73	78	83	89	95	101	107	114	120	127	134	141	148
18	43	48	52	57	61	66	72	77	83	88	94	101	107	113	120	127	134	142	149	157
19	46	50	55	60	65	70	76	81	87	93	100	106	113	120	127	134	142	150	158	166
20	48	53	58	63	68	74	80	86	92	98	105	112	119	126	134	141	149	158	166	175
21	51	55	61	66	72	77	83	90	96	103	110	117	125	132	140	148	157	165	174	183
22	53	58	63	69	75	81	87	94	101	108	115	123	131	139	147	156	164	173	183	192
23	55	61	66	72	78	85	91	98	105	113	121	128	137	145	154	163	172	181	191	201
24	58	63	69	75	82	88	95	103	110	118	126	134	143	151	160	170	179	189	199	209
25	60	66	72	79	85	92	99	107	115	123	131	140	148	158	167	177	187	197	207	218
26	63	69	75	82	89	96	103	111	119	128	136	145	154	164	174	184	194	205	216	227
27	65	71	78	85	92	100	107	115	124	133	142	151	160	170	180	191	202	213	224	236
28	67	74	81	88	95	103	111	120	128	137	147	156	166	177	187	198	209	221	232	244
29	70	77	84	91	99	107	115	124	133	142	152	162	172	183	194	205	217	228	241	253
30	72	79	87	94	102	111	119	128	138	147	157	168	178	189	200	212	224	236	249	262
31	75	82	89	97	106	114	123	133	142	152	162	173	184	195	207	219	231	244	257	271
32	77	84	92	101	109	118	127	137	147	157	168	179	190	202	214	226	239	252	265	279

TABLE 30.—*Comparison of log rules*

Board foot values for 16-foot logs for log rules and in percentage of International [1]

Top diameter inside bark (inches)	International 1/4 kerf	Scribner		Scribner Decimal C		Spaulding		Doyle		Doyle and Scribner		Holland or Maine		Blodgett or New Hampshire		Humphrey or Vermont	
	Bd. ft.	Bd. ft.	Per-cent	Bd. ft.	Per-cent	Bd. ft.	Per-cent	Bd. ft.	Per-cent	Bd. ft.	Per-cent	Bd. ft.	Per-cent	Bd. ft.	Per-cent	Bd. ft.	Per-cent
4	5	(10)	200	(10)	200	----	----	----	----	----	----	(3)	60	13	260	11	220
5	10	(13)	130	(10)	100	----	----	1	10	1	10	(11)	110	19	190	16	160
6	20	18	90	20	100	----	----	4	20	4	20	20	100	26	130	24	120
7	30	24	80	30	100	----	----	9	30	9	30	31	103	35	117	32	107
8	40	32	80	30	75	----	----	16	40	16	40	44	110	43	108	43	108
9	50	42	84	40	80	----	----	25	50	25	50	52	104	54	108	53	106
10	65	54	83	60	92	50	77	36	55	36	55	68	105	66	102	67	103
11	80	64	80	70	88	63	79	49	61	49	61	83	104	78	98	80	100
12	95	79	83	80	84	77	81	64	67	64	67	105	111	92	97	96	101
13	115	97	84	100	87	94	82	81	70	81	70	120	104	106	92	112	97
14	135	114	84	110	81	114	84	100	74	100	74	142	105	123	91	131	97
15	160	142	89	140	88	137	86	121	76	121	76	161	101	139	87	149	93
16	180	159	88	160	89	161	89	144	80	144	80	179	99	157	87	171	95
17	205	185	90	180	88	188	92	169	82	169	82	205	100	176	86	192	94
18	230	213	93	210	91	2₁6	94	196	85	196	85	232	101	197	86	216	94
19	260	240	92	240	92	245	94	225	87	225	87	271	104	217	83	240	92
20	290	280	97	280	97	276	95	256	88	256	88	302	104	240	83	267	92
21	320	304	95	300	94	308	96	289	90	289	90	336	105	262	82	293	92
22	355	334	94	330	93	341	96	324	91	324	91	363	102	287	81	323	91
23	390	377	97	380	97	376	96	361	93	361	93	401	103	313	80	352	90
24	425	404	95	400	94	412	97	400	94	400	94	439	103	339	80	384	90
25	460	459	100	460	100	449	98	441	96	441	96	477	104	367	80	416	90
26	500	500	100	500	100	488	98	484	97	484	97	507	101	397	79	451	90
27	540	548	101	550	102	528	98	529	98	530	98	546	101	426	79	485	90
28	585	582	99	580	99	569	97	576	98	582	99	614	105	457	78	523	89
29	630	609	97	610	97	612	97	625	99	609	97	657	104	489	78	560	89
30	675	657	97	660	98	656	97	676	100	657	97	706	105	514	76	600	89
31	720	710	99	710	99	701	97	728	101	710	99	755	105	557	77	640	89
32	770	736	96	740	96	748	97	784	102	736	96	792	103	592	77	683	89
33	820	784	96	780	95	796	97	841	103	784	96	848	103	628	77	725	88
34	875	800	91	800	91	845	97	900	103	800	91	900	103	666	76	771	88
35	925	876	95	880	95	897	97	961	104	876	95	949	103	704	76	816	88
36	980	923	94	920	94	950	97	1,024	104	923	94	1,026	105	744	76	864	88
37	1,040	1,029	99	1,030	99	1,006	97	1,089	105	1,029	99	1,089	105	785	75	912	88
38	1,095	1,068	98	1,070	98	1,064	97	1,156	106	1,068	98	1,135	104	827	76	963	88
39	1,155	1,120	97	1,120	97	1,124	97	1,225	106	1,120	97	1,209	105	870	75	1,013	88
40	1,220	1,204	99	1,200	98	1,185	97	1,296	106	1,204	99	1,261	103	914	75	1,067	87

[1] International log rule for saws cutting a 1/4-inch kerf taken as a standard = 100 percent.

TABLE 31.—*Ratios for customary map scales*

Scale 1 to—	Inches per mile	Miles per inch	Feet per inch	Meters per inch	Feet per ½₂₅ inch	Acres per square inch	Square miles per square inch
600	105. 6	0. 0095	50	15. 2	2	0. 06	0. 0001
1,200	52. 8	. 0189	100	30. 5	4	. 23	. 0004
2,500	25. 344	. 0395	208	63. 5	8. 3	1. 00	. 0016
4,800	13. 2	. 0758	400	121. 9	16	3. 67	. 0057
5,280	12	. 0833	440	134. 1	17. 6	4. 44	. 007
10,000	6. 336	. 1578	833	254. 0	33. 3	15. 93	. 0249
15,840	4	. 25	1, 320	402. 3	52. 8	40. 00	. 0625
20,000	3. 168	. 3	1, 584	482. 8	63. 4	57. 60	. 0900
24,000	2. 64	. 38	2, 000	609. 6	80	91. 83	. 1435
25,000	2. 53	. 39	2, 083	635. 0	83. 3	99. 64	. 1557
31,680	2	. 5	2, 640	804. 7	105. 6	160	. 2500
45,000	1. 408	. 7102	3, 750	1, 143. 0	150	322	. 5031
63,360	1	1	5, 280	1, 609. 3	211. 2	640	1. 00
90,000	. 704	1. 4205	7, 500	2, 286. 0	300	1, 291	2. 02
96,000	. 66	1. 5152	8, 000	2, 438. 4	320	1, 469	2. 30
125,000	. 507	1. 9729	10, 417	3, 175. 0	416. 7	2, 491	3. 89
500,000	. 127	7. 8914	41, 667	12, 700. 0	1, 666. 7	------------	62. 3
1,000,000	. 063	15. 7828	83, 333	25, 400. 1	3, 333. 3	------------	249
2,500,000	. 025	39. 4571	208, 333	63, 500. 1	8, 333. 3	------------	1, 556

TABLE 32.—*Vertical aerial photo scale relations*

Representative fraction	Inches per mile [1]	Representative fraction	Inches per per mile [1]
1:31,680	2. 0	1:15,500	4. 088
1:24,000	2. 640	1:15,000	4. 224
1:23,500	2. 696	1:14,500	4. 370
1:23,000	2. 755	1:14,000	4. 526
1:22,500	2. 813	1:13,500	4. 693
1:22,000	2. 880	1:13,000	4. 874
1:21,500	2. 947	1:12,672	5. 0
1:21,120	3. 0	1:12,500	5. 069
1:21,000	3. 017	1:12,000	5. 280
1:20,500	3. 091	1:11,500	5. 510
1:20,000	3. 168	1:11,000	5. 760
1:19,500	3. 249	1:10,560	6. 0
1:19,000	3. 335	1:10,500	6. 034
1:18,500	3. 425	1:10,000	6. 336
1:18,000	3. 520	1:9,500	6. 669
1:17,500	3. 620	1:9,051	7. 0
1:17,000	3. 727	1:9,000	7. 040
1:16,500	3. 840	1:8,500	7. 454
1:16,000	3. 960	1:8,000	7. 920
1:15,840	4. 0	1:7,920	8. 0

[1] Scale in inches per mile=representative fraction $\times$ 63,360 (constant).

TABLE 33.—*Number of seeds per unit weight*

Number per ounce	Number per gram	Number per pound	Number per kilogram
100	3.5273	1,600	3,527.3
125	4.4092	**2,000**	4,409.2
141.75	**5.0**	2,268	5,000.0
150	5.291	2,400	5,291.0
200	7.0547	3,200	7,054.7
283.5	**10.0**	4,536	10,000.0
300	10.5820	4,800	10,582.0
312.5	11.0229	**5,000**	11,022.9
400	14.1094	6,000	14,109.4
425.25	**15.0**	6,804	15,000.0
500	17.6366	8,000	17,636.6
567	**20**	9,072	20,000.0
600	21.16	9,600	21,160.0
625	22.0459	**10,000**	22,045.9
700	24.6914	11,200	24,691.4
708.75	**25**	11,340	25,000.0
800	28.2187	12,800	28,218.7
850.5	**30**	13,608	30,000
900	31.7460	14,400	31,746.0
937.5	33.0688	**15,000**	33,068.8
1,000	35.2734	16,000	35,273.4
1,134	**40**	18,144	40,000.0
1,250	44.0917	**20,000**	44,091.7
1,417.5	**50**	22,680	50,000
1,500	52.9100	24,000	52,910.0
1,562.5	55.1146	**25,000**	55,114.6
1,701	**60**	27,216	60,000
1,750	61.7284	28,000	61,728.4
1,875	66.1376	**30,000**	66,137.6
1,984.5	**70**	31,752	70,000
2,000	70.5467	32,000	70,546.7
2,268	**80**	36,288	80,000
2,500	88.1834	40,000	88,183.4
2,551.5	**90.0**	40,824	90,000
2,750	97.0018	44,000	97,001.8
2,835	**100**	45,360	100,000.0
3,000	105.8201	48,000	105,820.1
3,125	110.2293	**50,000**	110,229.3
3,750	132.2751	60,000	132,275.1
4,000	141.0934	64,000	141,093.4
4,375	154.3210	70,000	154,321.0
5,000	176.3668	80,000	176,366.8
5,625	198.4127	90,000	198,412.7
6,000	211.6402	96,000	211,640.2
6,250	220.4586	**100,000**	220,458.6
7,000	246.9136	112,000	246,913.6
7,812.5	275.5732	125,000	275,573.2
9,375	330.6878	**150,000**	330,687.8
10,000	352.7337	160,000	352,733.7
12,500	440.9171	200,000	440,917.1
14,175	**500**	226,800	500,000
15,000	529.1005	240,000	529,100.5
15,625	551.1464	**250,000**	551,146.4
20,000	705.4674	320,000	705,467.4
28,350	**1,000**	453,600	1,000,000
30,000	1,058.2011	480,000	1,058,201.1
31,250	1,102.2928	500,000	1,102,292.8

TABLE 34.—*Number of seeds or plants per unit area*

Side dimensions — Rectangular inches	Side dimensions — Square Inches	Side dimensions — Square Feet	Number per square foot	Number per milacre
--------	0.85	0.07	**200**	8,712
1 x 1	1.0	.08	144	6,273
--------	1.2	.1	**100**	4,356
--------	1.38	.115	**75**	3,267
1 x 2	1.41	.118	72	3,136
--------	1.70	.14	**50**	2,178
1 x 3	1.73	.14	48	2,091
--------	1.90	.16	**40**	1,742
1 x 4	2.0	.17	36	1,568
--------	2.19	.18	**30**	1,307
1 x 5	2.23	.19	29	1,254
--------	2.4	.2	**25**	1,089
1 x 6	2.45	.204	24	1,045
--------	2.51	.21	23	**1,000**
1 x 7	2.65	.22	21	894
1 x 8	2.83	.24	18	784
1 x 9	3.01	.25	16	695
--------	3.16	.263	**15**	653
1 x 10	3.17	.264	14	627
2 x 2	2.0	.17	36	1,568
2 x 3	2.45	.204	24	1,045
2 x 4	2.83	.24	18	784
2 x 5	3.17	.264	14	627
2 x 6	3.47	.29	12	523
--------	3.54	.295	11	**500**
2 x 7	3.72	.31	10	447
--------	3.80	.317	**10**	436
2 x 8	4.0	.33	9	392
2 x 9	4.26	.36	8	348
2 x 10	4.48	.37	7	314
3 x 3	3.0	.25	16	697
3 x 4	3.47	.29	12	523
3 x 5	3.87	.32	10	418
3 x 6	4.24	.35	8	348
--------	4.58	.38	7	**300**
3 x 8	4.8	.40	6	261
3 x 9	5.22	0.44	5	232
--------	5.36	.45	5	218
3 x 10	5.48	.46	**5**	209
4 x 4	4.0	.33	9	392
4 x 5	4.48	.37	7	314
--------	4.58	.38	7	300
4 x 6	4.80	.40	6	261
4 x 7	5.29	.44	5	223
4 x 8	5.66	.47	5	196
4 x 9	6.03	.50	4	174
4 x 10	6.35	.53	4	157
5 x 5	5.00	.42	6	251
5 x 6	5.48	.46	5	209
--------	5.71	.48	**5**	200
5 x 7	5.94	.495	4	179
5 x 8	6.35	.53	4	157
5 x 9	6.70	.56	3	139
--------	6.94	.58	3	131
5 x 10	7.10	.59	3	125
6 x 6	6	.5	4	174
6 x 8	6.94	.58	3	131
6 x 9	7.36	.61	3	116
6 x 10	7.74	.64	2.4	104
7 x 7	7.02	.58	2.92	127
7 x 8	7.5	.62	2.56	112
--------	7.95	.66	2.3	**100**
7 x 10	8.39	.70	2.05	89
8 x 8	8.0	.67	2.25	98
8 x 9	8.51	.71	2.00	87
8 x 10	8.96	.747	1.80	78
9 x 9	9.02	.75	1.77	77
--------	9.16	.76	1.72	**75**
10 x 10	10	.83	1.44	63
--------	11.21	.93	1.15	**50**
12 x 12	12	1.0	1.0	44

TABLE 35.—*Discharge in second-feet per day converted into runoff in millions of gallons*

Tens	Units									
	0	1	2	3	4	5	6	7	8	9
0		0.65	1.29	1.94	2.59	3.23	3.88	4.52	5.17	5.82
1	6.46	7.11	7.76	8.40	9.05	9.69	10.34	10.99	11.63	12.28
2	12.93	13.57	14.22	14.87	15.51	16.16	16.80	17.45	18.10	18.74
3	19.39	20.04	20.68	21.33	21.97	22.62	23.27	23.91	24.56	25.21
4	25.85	26.50	27.15	27.79	28.44	29.08	29.73	30.38	31.02	31.67
5	32.32	32.96	33.61	34.25	34.90	35.55	36.19	36.84	37.49	38.13
6	38.78	39.43	40.07	40.72	41.36	42.01	42.66	43.30	43.95	44.60
7	45.24	45.89	46.53	47.18	47.83	48.47	49.12	49.77	50.41	51.06
8	51.71	52.35	53.00	53.64	54.29	54.94	55.58	56.23	56.88	57.52
9	58.17	58.81	59.46	60.11	60.75	61.40	62.05	62.69	63.34	63.99

1 second-foot equivalent to 7.4805 gallons per second per day, 448.83 gallons per minute per day, 26,929.8 gallons per hour per day, or 646,315.2 gallons per day.

TABLE 36.—*Runoff in million gallons converted to discharge in second-feet per day*

Tens	Units									
	0	1	2	3	4	5	6	7	8	9
0		1.55	3.09	4.64	6.19	7.74	9.28	10.83	12.38	13.93
1	15.47	17.02	18.57	20.11	21.66	23.21	24.76	26.30	27.85	29.40
2	30.94	32.49	34.04	35.59	37.13	38.68	40.23	41.78	43.32	44.87
3	46.42	47.96	49.51	51.06	52.61	54.15	55.70	57.25	58.79	60.34
4	61.89	63.44	64.98	66.53	68.08	69.63	71.17	72.72	74.27	75.81
5	77.36	78.91	80.46	82.00	83.55	85.10	86.64	88.19	89.74	91.29
6	92.83	94.38	95.93	97.48	99.02	100.57	102.12	103.66	105.21	106.76
7	108.31	109.85	111.40	112.95	114.49	116.04	117.59	119.14	120.68	122.23
8	123.78	125.33	126.87	128.42	129.97	131.51	133.06	134.61	136.16	137.70
9	139.25	140.80	142.34	143.89	145.44	146.99	148.53	150.08	151.63	153.18

1,000,000 gallons in 24 hours equivalent to 1.547 second-feet.

TABLE 37.—*Runoff in acre-feet converted to runoff in million gallons*

Tens	Units									
	0	1	2	3	4	5	6	7	8	9
0		0.326	0.652	0.978	1.303	1.629	1.955	2.281	2.607	2.933
1	3.258	3.584	3.910	4.236	4.562	4.888	5.214	5.540	5.865	6.191
2	6.517	6.843	7.169	7.495	7.820	8.146	8.472	8.798	9.124	9.450
3	9.776	10.101	10.427	10.753	11.079	11.405	11.731	12.056	12.382	12.708
4	13.034	13.360	13.686	14.012	14.337	14.663	14.989	15.315	15.641	15.967
5	16.293	16.618	16.944	17.270	17.596	17.922	18.248	18.574	18.899	19.225
6	19.551	19.877	20.203	20.529	20.854	21.180	21.506	21.832	22.158	22.484
7	22.810	23.135	23.461	23.787	24.113	24.439	24.765	25.090	25.416	25.742
8	26.068	26.394	26.720	27.046	27.372	27.697	28.023	28.349	28.675	29.001
9	29.327	29.652	29.978	30.304	30.630	30.956	31.282	31.608	31.933	32.259

1 acre-foot equals 43,560 cubic feet; equivalent to 325,850 gallons.

TABLE 38.—*Runoff in million gallons converted into runoff in acre-feet*

Tens	Units									
	0	1	2	3	4	5	6	7	8	9
0		3.07	6.14	9.21	12.28	15.34	18.41	21.48	24.55	27.62
1	30.69	33.76	36.83	39.90	42.96	46.03	49.10	52.17	55.24	58.31
2	61.38	64.45	67.52	70.58	73.65	76.72	79.79	82.86	85.93	89.00
3	92.07	95.14	98.20	101.27	104.34	107.41	110.48	113.55	116.62	119.69
4	122.76	125.82	128.89	131.96	135.03	138.10	141.17	144.24	147.31	150.38
5	153.44	156.51	159.58	162.65	165.72	168.79	171.86	174.93	178.00	181.06
6	184.13	187.20	190.27	193.34	196.41	199.48	202.55	205.62	208.68	211.75
7	214.82	217.89	220.96	224.03	227.10	230.17	233.24	236.30	239.37	242.44
8	245.51	248.58	251.65	254.72	257.79	260.86	263.92	266.99	270.06	273.13
9	276.20	279.27	282.34	285.41	288.48	291.54	294.61	297.68	300.75	303.82

1,000,000 liquid gallons (231,000,000 cubic inches) equivalent to 3.0689 acre-feet

TABLE 39.—*Discharge of water: conversion of second-feet into runoff in acre-feet*

Second-feet	Period in days								
	1	5	10	15	20	28	29	30	31
1	1.98	9.92	19.83	29.75	39.66	55.5	57.5	59.5	61.5
2	3.97	19.84	39.67	59.50	79.34	111.1	115.0	119.0	123.0
3	5.95	29.75	59.50	89.25	119.0	166.6	172.6	178.5	184.5
4	7.93	39.67	79.34	119.01	158.68	222.1	230.1	238.0	246.0
5	9.92	49.58	99.17	148.76	198.34	277.7	287.6	297.5	307.4
6	11.90	59.50	119.0	178.50	238.0	333.2	345.1	357.0	368.9
7	13.88	69.40	138.8	208.20	277.60	388.8	402.6	416.5	430.4
8	15.87	79.35	158.7	238.05	317.40	444.3	460.2	476.0	491.9
9	17.85	89.25	178.5	267.75	357.0	499.8	517.7	535.5	553.4

TABLE 40.—*Discharge of water: conversion of second-feet per square mile into runoff in depth in inches over the area*

Second-feet per square mile	Period in days							
	1	5	10	15	28	29	30	31
1	0.03719	0.18595	0.3719	0.5579	1.041	1.079	1.116	1.153
2	.07438	.37190	.7438	1.1157	2.083	2.157	2.231	2.306
3	.11157	.55785	1.1157	1.6736	3.124	3.236	3.347	3.459
4	.14876	.74380	1.4876	2.2314	4.165	4.314	4.463	4.612
5	.18595	.92975	1.8595	2.7892	5.207	5.393	5.579	5.764
6	.22314	1.1157	2.2314	3.3471	6.248	6.471	6.694	6.917
7	.26033	1.3017	2.6033	3.9049	7.289	7.550	7.810	8.070
8	.29752	1.4876	2.9752	4.4628	8.331	8.628	8.926	9.223
9	.33471	1.67355	3.3471	5.0207	9.372	9.707	10.041	10.376

TABLE 41.—*Inches depth in terms of approximate volume per unit area* [1]

Inches depth	Cubic feet per acre	Cubic yards per square mile	Inches depth	Cubic feet per acre	Cubic yards per square mile
0.01	36	860	0.24	871	20,651
.02	73	1,721	.25	908	21,511
.03	109	2,581	.26	944	22,372
.04	145	3,442	.27	980	23,232
.05	182	4,302	.28	1,016	24,092
.06	218	5,163	.29	1,053	24,953
.07	254	6,023	.30	1,089	25,813
.08	290	6,884	.33	1,198	28,395
.09	327	7,744	.35	1,270	30,116
.10	363	8,604	.40	1,452	34,418
.11	399	9,465	.45	1,634	38,720
.12	436	10,325	.50	1,815	43,022
.13	472	11,186	.55	1,996	47,324
.14	508	12,046	.60	2,178	51,627
.15	545	12,907	.65	2,360	55,929
.16	581	13,767	.70	2,541	60,231
.17	617	14,628	.75	2,723	64,533
.18	653	15,488	.80	2,904	68,836
.19	690	16,348	.85	3,085	73,138
.20	726	17,209	.90	3,267	77,440
.21	762	18,069	.95	3,449	81,742
.22	799	18,930	1.00	3,630	86,044
.23	835	19,790			

[1] Inches depth multiplied by 3,630 gives the number of cubic feet per acre to a depth of 1 inch: multiplied by 86,044.44 gives the number of cubic yards per square mile to a depth of 1 inch.

TABLE 42.—*Random numbers: ten thousand randomly assorted digits* [1]

	00–04	05–09	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49
00	54463	22662	65905	70639	79365	67382	29085	69831	47058	08186
01	15389	85205	18850	39226	42249	90669	96325	23248	60933	26927
02	85941	40756	82414	02015	13858	78030	16269	65978	01385	15345
03	61149	69440	11286	88218	58925	03638	52862	62733	33451	77455
04	05219	81619	10651	67079	92511	59888	84502	72095	83463	75577
05	41417	98326	87719	92294	46614	50948	64886	20002	97365	30976
06	28357	94070	20652	35774	16249	75019	21145	05217	47286	76305
07	17783	00015	10806	83091	91530	36466	39981	62481	49177	75779
08	40950	84820	29881	85966	62800	70326	84740	62660	77379	90279
09	82995	64157	66164	41180	10089	41757	78258	96488	88629	37231
10	96754	17676	55659	44105	47361	34833	86679	23930	53249	27083
11	34357	88040	53364	71726	45690	66334	60332	22554	90600	71113
12	06318	37403	49927	57715	50423	67372	63116	48888	21505	80182
13	62111	52820	07243	79931	89292	84767	85693	73947	22278	11551
14	47534	09243	67879	00544	23410	12740	02540	54440	32949	13491
15	98614	75993	84460	62846	59844	14922	48730	73443	48167	34770
16	24856	03648	44898	09351	98795	18644	39765	71058	90368	44104
17	96887	12479	80621	66223	86085	78285	02432	53342	42846	94771
18	90801	21472	42815	77408	37390	76766	52615	32141	30268	18106
19	55165	77312	83666	36028	28420	70219	81369	41943	47366	41067
20	75884	12952	84318	95108	72305	64620	91318	89872	45375	85436
21	16777	37116	58550	42958	21460	43910	01175	87894	81378	10620
22	46230	43877	80207	88877	89380	32992	91380	03164	98656	59337
23	42902	66892	46134	01432	94710	23474	20423	60137	60609	13119
24	81007	00333	39693	28039	10154	95425	39220	19774	31782	49037
25	68089	01122	51111	72373	06902	74373	96199	97017	41273	21546
26	20411	67081	89950	16944	93054	87687	96693	87236	77054	33848
27	58212	13160	06468	15718	82627	76999	05999	58680	96739	63700
28	70577	42866	24969	61210	76046	67699	42054	12696	93758	03283
29	94522	74358	71659	62038	79643	79169	44741	05437	39038	13163
30	42626	86819	85651	88678	17401	03252	99547	32404	17918	62880
31	16051	33763	57194	16752	54450	19031	58580	47629	54132	60631
32	08244	27647	33851	44705	94211	46716	11738	55784	95374	72655
33	59497	04392	09419	89964	51211	04894	72882	17805	21896	83864
34	97155	13428	40293	09985	58434	01412	69124	82171	59058	82859
35	98409	66162	95763	47420	20792	61527	20441	39435	11859	41567
36	45476	84882	65109	96597	25930	66790	65706	61203	53634	22557
37	89300	69700	50741	30329	11658	23166	05400	66669	48708	03887
38	50051	95137	91631	66315	91428	12275	24816	68091	71710	33258
39	31753	85178	31310	89642	98364	02306	24617	09609	83942	22716
40	79152	53829	77250	20190	56535	18760	69942	77448	33278	48805
41	44560	38750	83635	56540	64900	42912	13953	79149	18710	68618
42	68328	83378	63369	71381	39564	05615	42451	64559	97501	65747
43	46939	38689	58625	08342	30459	85863	20781	09284	26333	91777
44	83544	86141	15707	96256	23068	13782	08467	89469	93842	55349
45	91621	00881	04900	54224	46177	55309	17852	27491	89415	23466
46	91896	67126	04151	03795	59077	11848	12630	98375	52068	60142
47	55751	62515	21108	80830	02263	29303	37204	96926	30506	09808
48	85156	87689	95493	88842	00664	55017	55539	17771	69448	87530
49	07521	56898	12236	60277	39102	62315	12239	07105	11844	01117

[1] Table from Snedecor, George W.: Statistical Methods, 4th edition, 1946.

TABLE 42.—*Random numbers: ten thousand randomly assorted digits* [1]—Continued

	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99
00	59391	58030	52098	82718	87024	82848	04190	96574	90464	29065
01	99567	76364	77204	04615	27062	96621	43918	01896	83991	51141
02	10363	97518	51400	25670	98342	61891	27101	37855	06235	33316
03	86859	19558	64432	16706	99612	59798	32803	67708	15297	28612
04	11258	24591	36863	55368	31721	94335	34936	02566	80972	08188
05	95068	88628	35911	14530	33020	80428	39936	31855	34334	64865
06	54463	47237	73800	91017	36239	71824	83671	39892	60518	37092
07	16874	62677	57412	13215	31389	62233	80827	73917	82802	84420
08	92494	63157	76593	91316	03505	72389	96363	52887	01087	66091
09	15669	56689	35682	40844	53256	81872	35213	09840	34471	74441
10	99116	75486	84989	23476	52967	67104	39495	39100	17217	74073
11	15696	10703	65178	90637	63110	17622	53988	71087	84148	11670
12	97720	15369	51269	69620	03388	13699	33423	67453	43269	56720
13	11666	13841	71681	98000	35979	39719	81899	07449	47985	46967
14	71628	73130	78783	75691	41632	09847	61547	18707	85489	69944
15	40501	51089	99943	91843	41995	88931	73631	69361	05375	15417
16	22518	55576	98215	82068	10798	86211	36584	67466	69373	40054
17	75112	30485	62173	02132	14878	92879	22281	16783	86352	00077
18	80327	02671	98191	84342	90813	49268	95441	15496	20168	09271
19	60251	45548	02146	05597	48228	81366	34598	72856	66762	17002
20	57430	82270	10421	05540	43648	75888	66049	21511	47676	33444
21	73528	39559	34434	88596	54086	71693	43132	14414	79949	85193
22	25991	65959	70769	64721	86413	33475	42740	06175	82758	66248
23	78388	16638	09134	59880	63806	48472	39318	35434	24057	74739
24	12477	09965	96657	57994	59439	76330	24596	77515	09577	91871
25	83266	32883	42451	15579	38155	29793	40914	65990	16255	17777
26	76970	80876	10237	39515	79152	74798	39357	09054	73579	92359
27	37074	65198	44785	68624	98336	84481	97610	78735	46703	98265
28	83712	06514	30101	78295	54656	85417	43189	60048	72781	72606
29	20287	56862	69727	94443	64936	08366	27227	05158	50326	59566
30	74261	32592	86538	27041	65172	85532	07571	80609	39285	65340
31	64081	49863	08478	96001	18888	14810	70545	89755	59064	07210
32	05617	75818	47750	67814	29575	10526	66192	44464	27058	40467
33	26793	74951	95466	74307	13330	42664	85515	20632	05497	33625
34	65988	72850	48737	54719	52056	01596	03845	35067	03134	70322
35	27366	42271	44300	73399	21105	03280	73457	43093	05192	48657
36	56760	10909	98147	34736	33863	95256	12731	66598	50771	83665
37	72880	43338	93643	58904	59543	23943	11231	83268	65938	81581
38	77888	38100	03062	58103	47961	83841	25878	23746	55903	44115
39	28440	07819	21580	51459	47971	29882	13990	29226	23608	15873
40	63525	94441	77033	12147	51054	49955	58312	76923	96071	05813
41	47606	93410	16359	89033	89696	47231	64498	31776	05383	39902
42	52669	45030	96279	14709	52372	87832	02735	50803	72744	88208
43	16738	60159	07425	62369	07515	82721	37875	71153	21315	00132
44	59348	11695	45751	15865	74739	05572	32688	20271	65128	14551
45	12900	71775	29845	60774	94924	21810	38636	33717	67598	82521
46	75086	23537	49939	33595	13484	97588	28617	17979	70749	35234
47	99495	51434	29181	09993	38190	42553	68922	52125	91077	40197
48	26075	31671	45386	36583	93459	48599	52022	41330	60651	91321
49	13636	93596	23377	51133	95126	61496	42474	45141	46660	42338

TABLE 42.—*Random numbers: ten thousand randomly assorted digits* [1]—Continued

	00–04	05–09	10–14	15–19	20–24	25–29	30–34	35–39	40–44	45–49
50	64249	63664	39652	40646	97306	31741	07294	84149	46797	82487
51	26538	44249	04050	48174	65570	44072	40192	51153	11397	58212
52	05845	00512	78630	55328	18116	69296	91705	86224	29503	57071
53	74897	68373	67359	51014	33510	83048	17056	72506	82949	54600
54	20872	54570	35017	88132	25730	22626	86723	91691	13191	77212
55	31432	96156	89177	75541	81355	24480	77243	76690	42507	84362
56	66890	61505	01240	00660	05873	13568	76082	79172	57913	93448
57	48194	57790	79970	33106	86904	48119	52503	24130	72824	21627
58	11303	87118	81471	52936	08555	28420	49416	44448	04269	27029
59	54374	57325	16947	45356	78371	10563	97191	53798	12693	27928
60	64852	34421	61046	90849	13966	39810	42699	21753	76192	10508
61	16309	20384	09491	91588	97720	89846	30376	76970	23063	35894
62	42587	37065	24526	72602	57589	98131	37292	05967	26002	51945
63	40177	98590	97161	41682	84533	67588	62036	49967	01990	72308
64	82309	76128	93965	26743	24141	04838	40254	26065	07938	76236
65	79788	68243	59732	04257	27084	14743	17520	95401	55811	76099
66	40538	79000	89559	25026	42274	23489	34502	75508	06059	86682
67	64016	73598	18609	73150	62463	33102	45205	87440	96767	67042
68	49767	12691	17903	93871	99721	79109	09425	26904	07419	76013
69	76974	55108	29795	08404	82684	00497	51126	79935	57450	55671
70	23854	08480	85983	96025	50117	64610	99425	62291	86943	21541
71	68973	70551	25098	78033	98573	79848	31778	29555	61446	23037
72	36444	93600	65350	14971	23525	00427	52073	64280	18847	24768
73	03003	87800	07391	11594	21196	00781	32550	57158	58887	73041
74	17540	26188	36647	78386	04558	61463	57842	90382	77019	24210
75	38916	55809	47982	41968	69760	79422	80154	91486	19180	15100
76	64288	19843	69122	42502	48508	28820	59933	72998	99942	10515
77	86809	51564	38040	39418	49915	19000	58050	16899	79952	57849
78	99800	99566	14742	05028	30033	94889	53381	23656	75787	59223
79	92345	31890	95712	08279	91794	94068	49337	88674	35355	12267
80	90363	65162	32245	82279	79256	80834	06088	99462	56705	06118
81	64437	32242	48431	04835	39070	59702	31508	60935	22390	52246
82	91714	53662	28373	34333	55791	74758	51144	18827	10704	76803
83	20902	17646	31391	31459	33315	03444	55743	74701	58851	27427
84	12217	86007	70371	52281	14510	76094	96579	54853	78339	20839
85	45177	02863	42307	53571	22532	74921	17735	42201	80540	54721
86	28325	90814	08804	52746	47913	54577	47525	77705	95330	21866
87	29019	28776	56116	54791	64604	08815	46029	71186	34650	14994
88	84979	81353	56219	67062	26146	82567	33122	14124	46240	92973
89	50371	26347	48513	63915	11158	25563	91915	18431	92978	11591
90	53422	06825	69711	67950	64716	18003	49581	45378	99878	61130
91	67453	35651	89316	41620	32048	70225	47597	33137	31443	51445
92	07294	85353	74819	23445	68237	07202	99515	62282	53809	26685
93	79544	00302	45338	16015	66613	88968	14595	63836	77716	79596
94	64144	85442	82060	46471	24162	39500	87351	36637	42833	71875
95	90919	11883	58318	00042	52402	28210	34075	33272	00840	73268
96	06670	57353	86275	92276	77591	46924	60839	55437	03183	13191
97	36634	93976	52062	83678	41256	60948	18685	48992	19462	96062
98	75101	72891	85745	67106	26010	62107	60885	37503	55461	71213
99	05112	71222	72654	51583	05228	62056	57390	42746	39272	96659

TABLE 42.—*Random numbers: ten thousand randomly assorted digits* [1]—Continued

	50–54	55–59	60–64	65–69	70–74	75–79	80–84	85–89	90–94	95–99
50	32847	31282	03345	89593	69214	70381	78285	20054	91018	16742
51	16916	00041	30236	55023	14253	76582	12092	86533	92426	37655
52	66176	34047	21005	27137	03191	48970	64625	22394	39622	79085
53	46299	13335	12180	16861	38043	59292	62675	63631	37020	78195
54	22847	47839	45385	23289	47526	54098	45683	55849	51575	64689
55	41851	54160	92320	69936	34803	92479	33399	71160	64777	83378
56	28444	59497	91586	95917	68553	28639	06455	34174	11130	91994
57	47520	62378	98855	83174	13088	16561	68559	26679	06238	51254
58	34978	63271	13142	82681	05271	08822	06490	44984	49307	62717
59	37404	80416	69035	92980	49486	74378	75610	74976	70056	15478
60	32400	65482	52099	53676	74648	94148	65095	69597	52771	71551
61	89262	86332	51718	70663	11623	29834	79820	73002	84886	03591
62	86866	09127	98021	03871	27789	58444	44832	36505	40672	30180
63	90814	14833	08759	74645	05046	94056	99094	65091	32663	73040
64	19192	82756	20553	58446	55376	88914	75096	26119	83898	43816
65	77585	52593	56612	95766	10019	29531	73064	20953	53523	58136
66	23757	16364	05096	03192	62386	45389	85332	18877	55710	96459
67	45989	96257	23850	26216	23309	21526	07425	50254	19455	29315
68	92970	94243	07316	41467	64837	52406	25225	51553	31220	14032
69	74346	59596	40088	98176	17896	86900	20249	77753	19099	48885
70	87646	41309	27636	45153	29988	94770	07255	70908	05340	99751
71	50099	71038	45146	06146	55211	99429	43169	66259	97786	59180
72	10127	46900	64984	75348	04115	33624	68774	60013	35515	62556
73	67995	81977	18984	64091	02785	27762	42529	97144	80407	64524
74	26304	80217	84934	82657	69291	35397	98714	35104	08187	48109
75	81994	41070	56642	64091	31229	02595	13513	45148	78722	30144
76	59537	34662	79631	89403	65212	09975	06118	86197	58208	16162
77	51228	10937	62396	81460	47331	91403	95007	06047	16846	64809
78	31089	37995	29577	07828	42272	54016	21950	86192	99046	84864
79	38207	97938	93459	75174	79460	55436	57206	87644	21296	43395
80	88666	31142	09474	89712	63153	62333	42212	06140	42594	43671
81	53365	56134	67582	92557	89520	33452	05134	70628	27612	33738
82	89807	74530	38004	90102	11693	90257	05500	79920	62700	43325
83	18682	81038	85662	90915	91631	22223	91588	80774	07716	12548
84	63571	32579	63942	25371	09234	94592	98475	76884	37635	33608
85	68927	56492	67799	95398	77642	54913	91853	08424	81450	76229
86	56401	63186	39389	88798	31356	89235	97036	32341	33292	73757
87	24333	95603	02359	72942	46287	95382	08452	62862	97869	71775
88	17025	84202	95199	62272	06366	16175	97577	99304	41587	03686
89	02804	08253	52133	20224	68034	50865	57868	22343	55111	03607
90	08298	03879	20995	19850	73090	13191	18963	82244	78479	99121
91	59883	01785	82403	96062	03785	03488	12970	64896	38336	30030
92	46982	06682	62864	91837	74021	89094	39952	64158	79614	78235
93	31121	47266	07661	02051	67599	24471	69843	83696	71402	76287
94	97867	56641	63416	17577	30161	87320	37752	73276	48969	41915
95	57364	86746	08415	14621	49430	22311	15836	72492	49372	44103
96	09559	26263	69511	28064	75999	44540	13337	10918	79846	54809
97	53873	55571	00608	42661	91332	63956	74087	59008	47493	99581
98	35531	19162	86406	05299	77511	24311	57257	22826	77555	05941
99	28229	88629	25695	94932	30721	16197	78742	34974	97528	45447
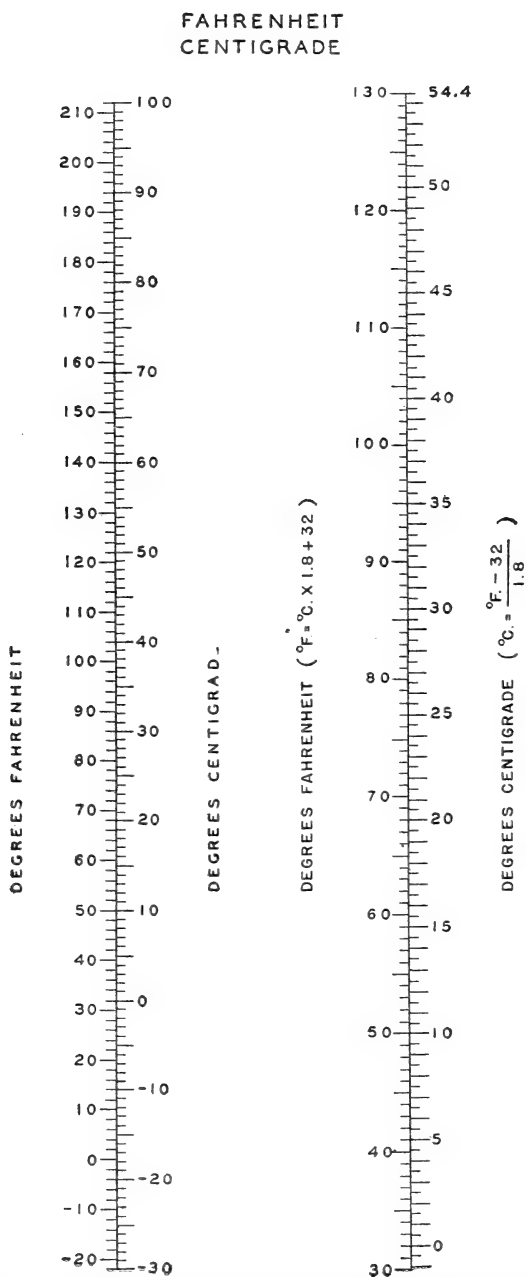
FIGURE 1.—Temperature alinement chart for converting Fahrenheit to centigrade.
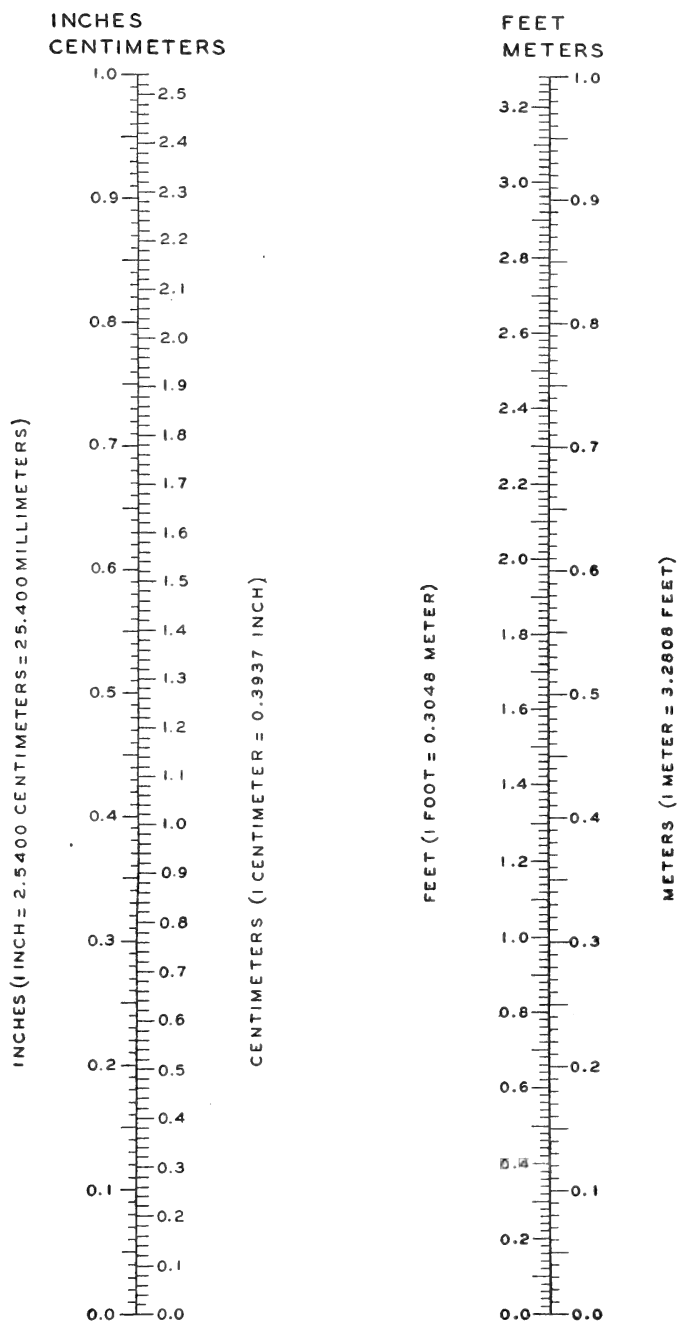
FIGURE 2.—Alinement charts for converting inches to centimeters and feet to meters.
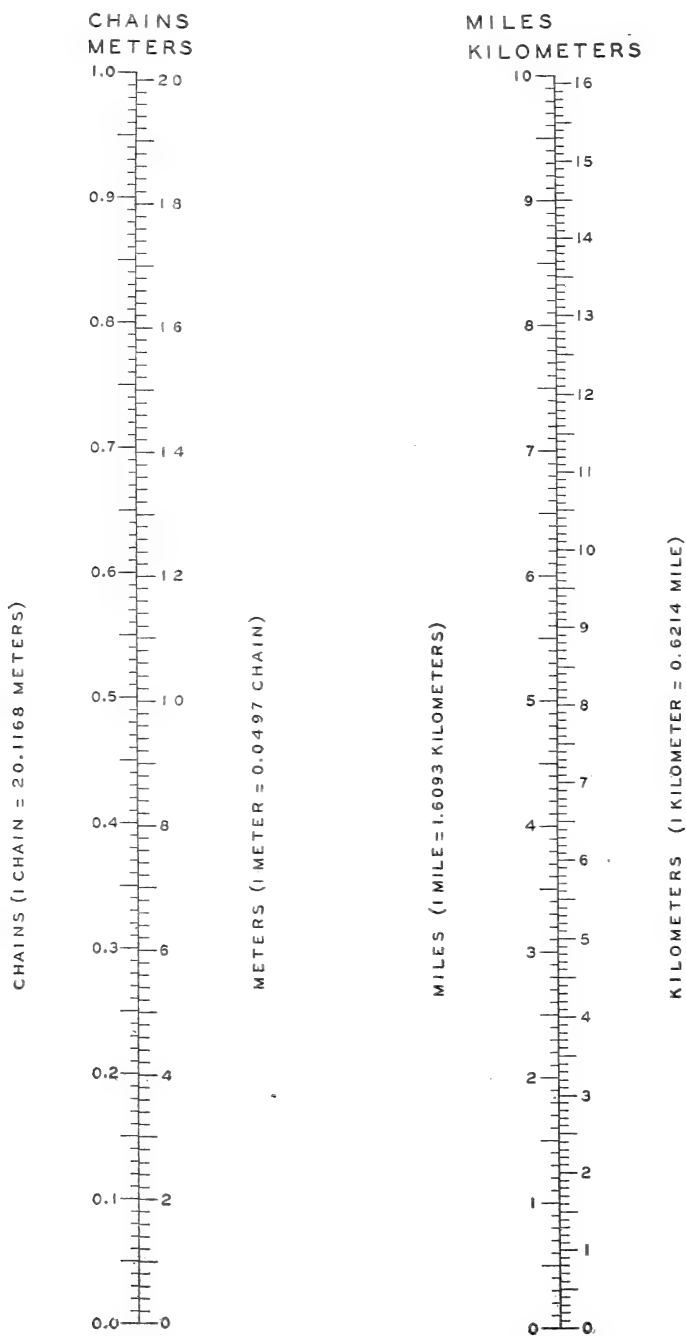
FIGURE 3.—Alinement charts for converting chains to meters and miles to kilometers.
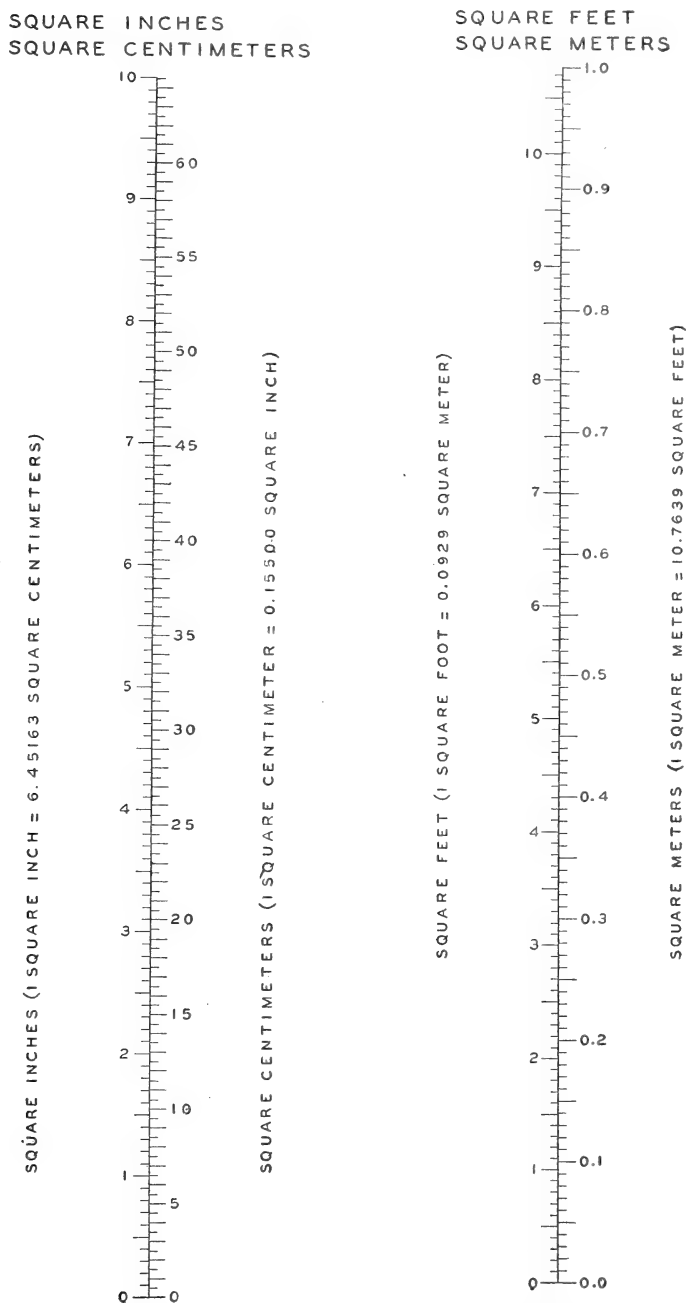
FIGURE 4.—Alinement charts for converting square inches to square centimeters and square feet to square meters.
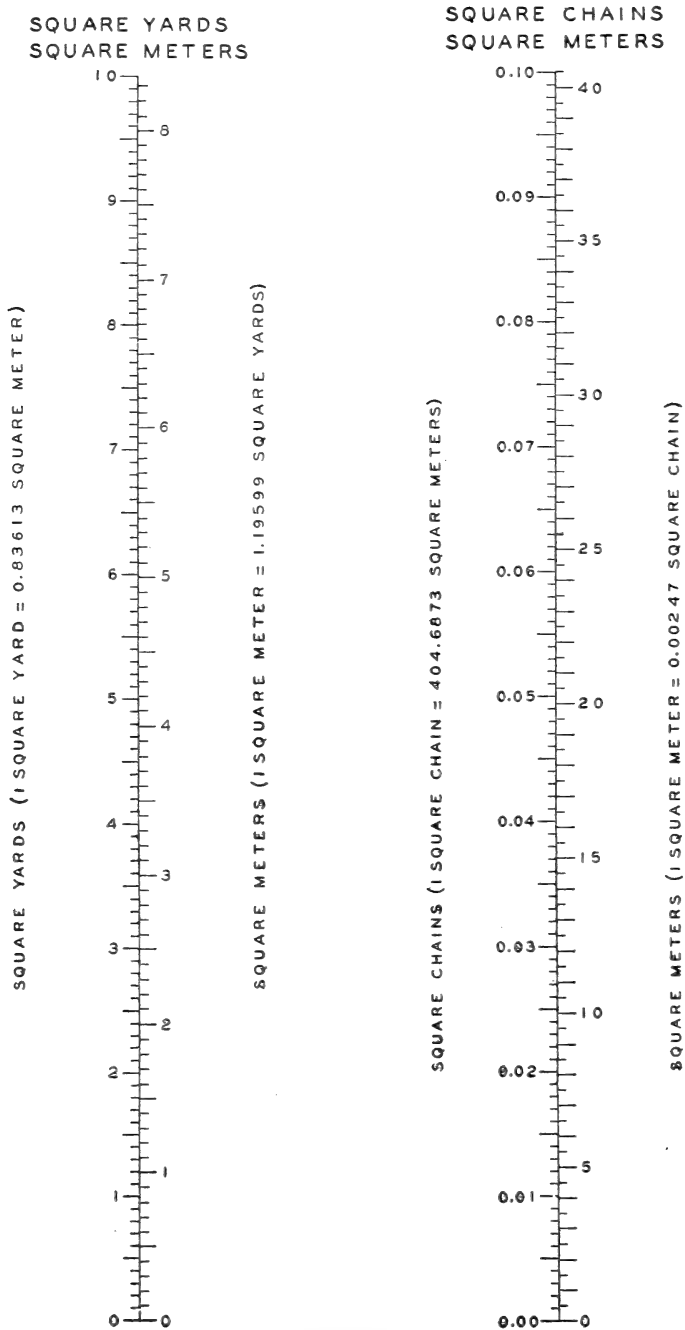
FIGURE 5.—Alinement charts for converting square yards to square meters and square chains to square meters.
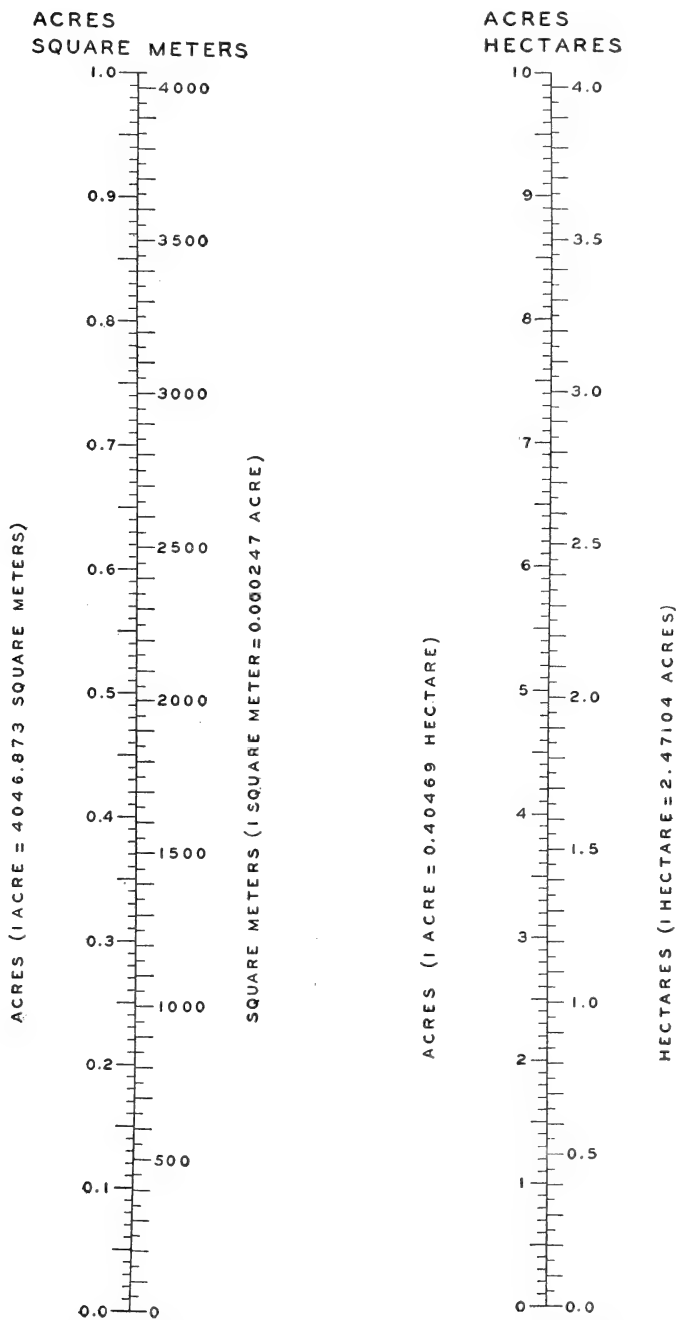
FIGURE 6.—Alinement charts for converting acres to square meters and hectares.
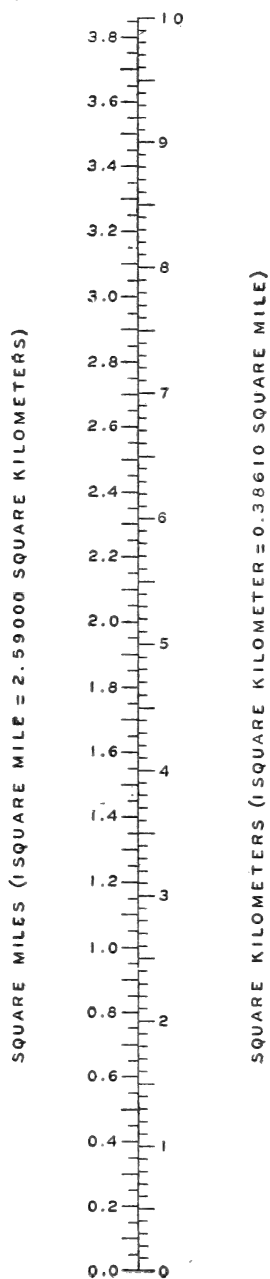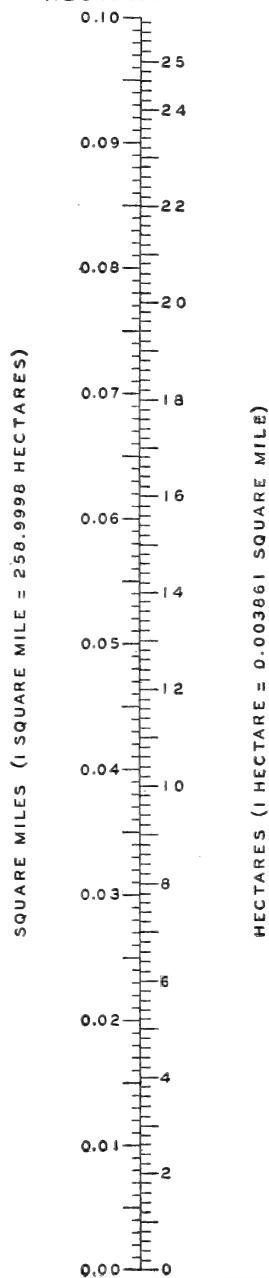
FIGURE 7.—Alinement charts for converting square miles to square kilometers and hectares.
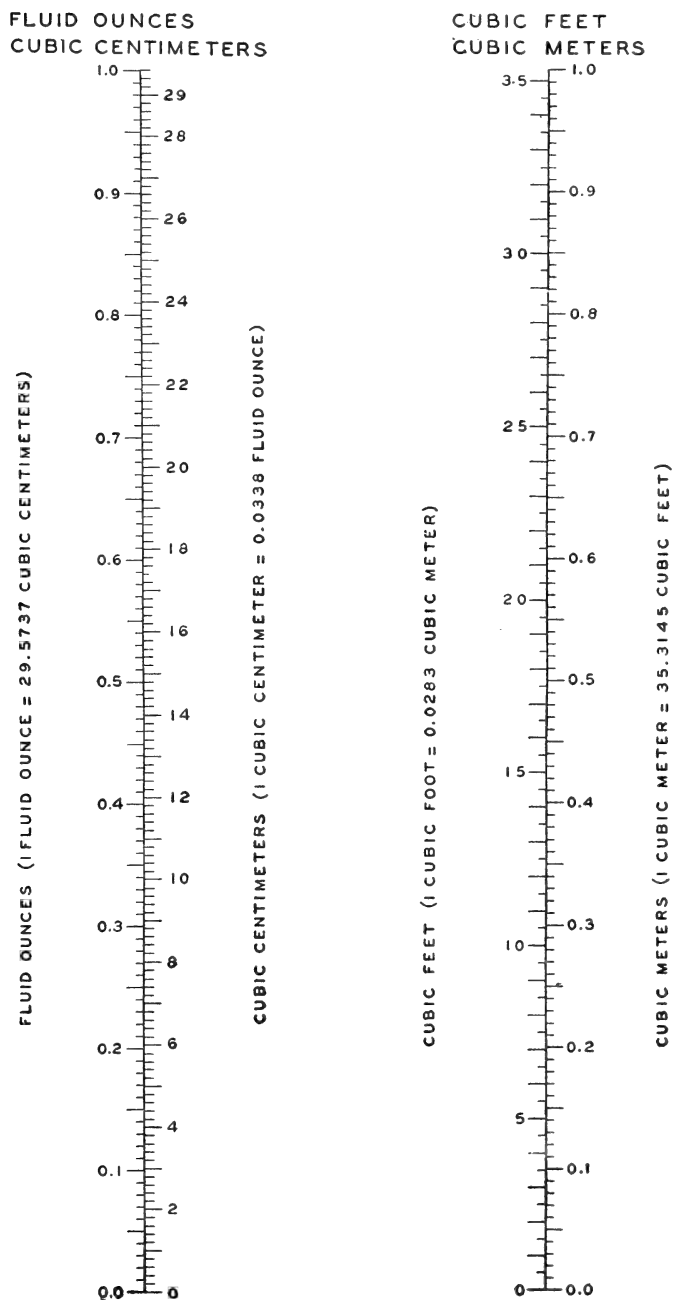
FIGURE 8.—Alinement charts for converting fluid ounces to cubic centimeters and cubic feet to cubic meters.
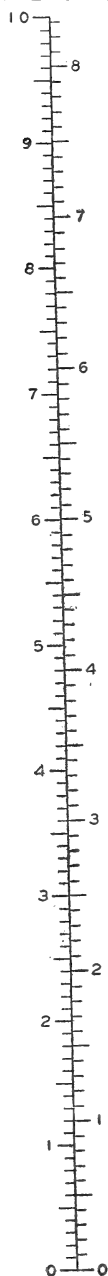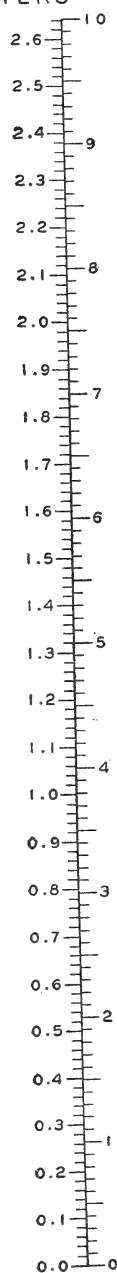
FIGURE 9.—Alinement charts for converting United States gallons to imperial gallons and liters.

IMPERIAL GALLONS
LITERS

BUSHELS
HECTOLITERS
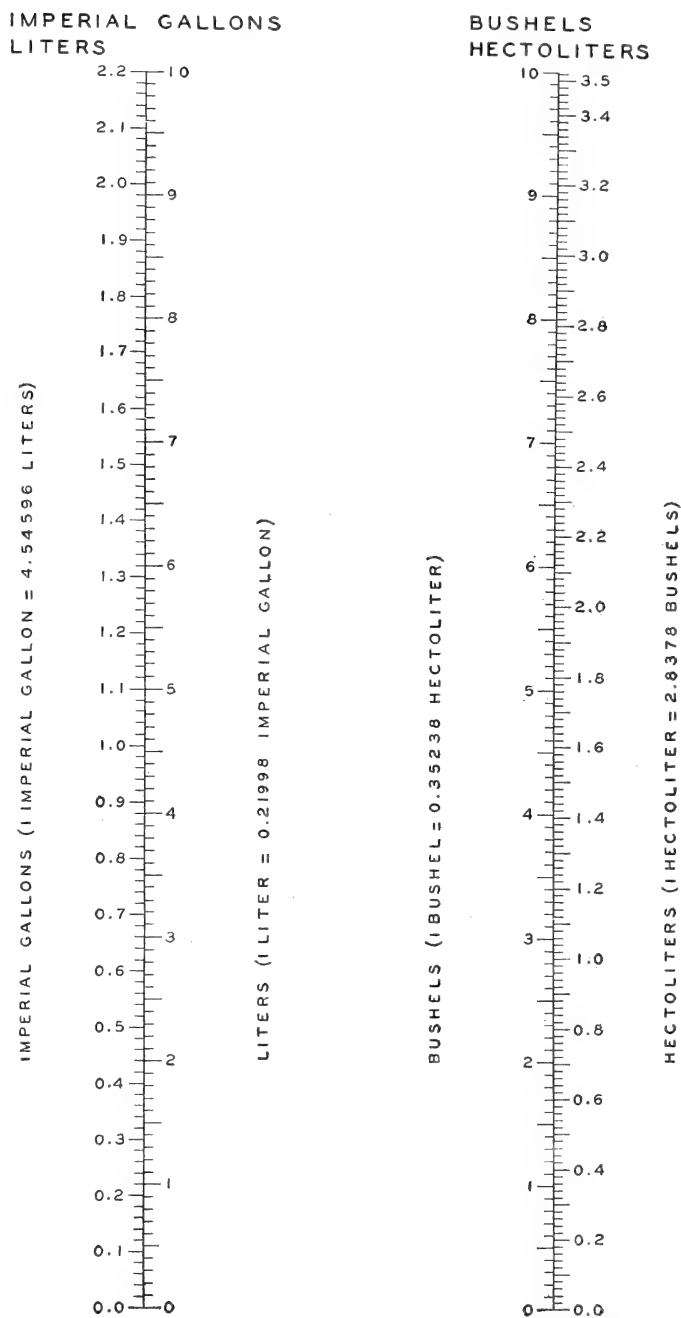
FIGURE 10.—Alinement charts for converting imperial gallons to liters and bushels to hectoliters.
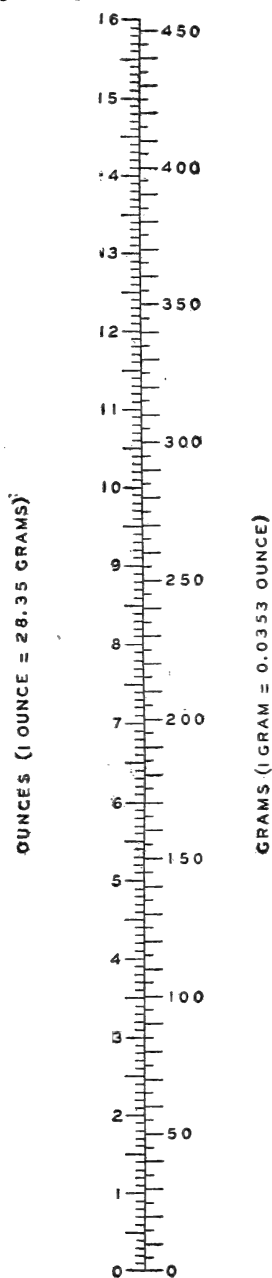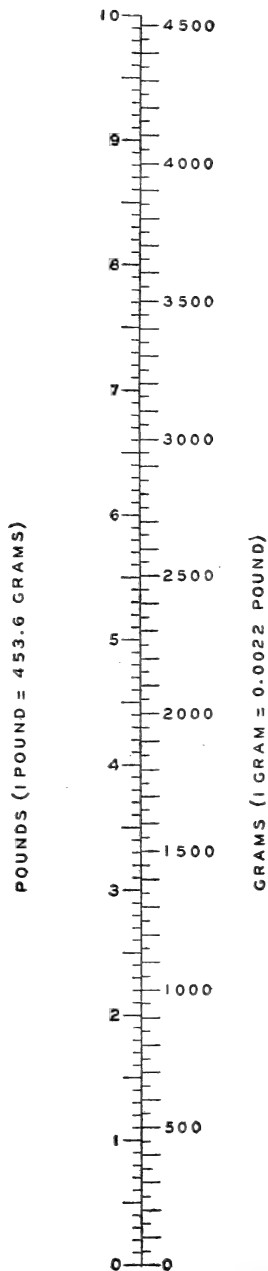
FIGURE 11.—Alinement charts for converting avoirdupois ounces to grams and pounds to grams.

FOOT-POUNDS
KILOGRAMMETERS
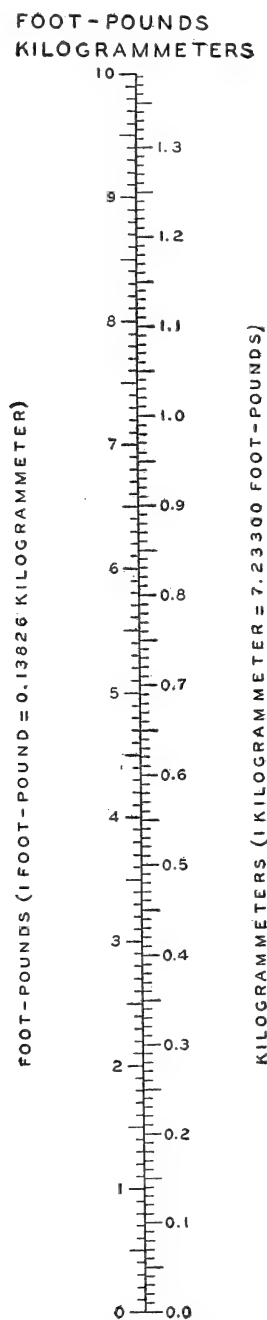
FIGURE 12.—Alinement chart for converting foot-pounds to kilogrammeters.
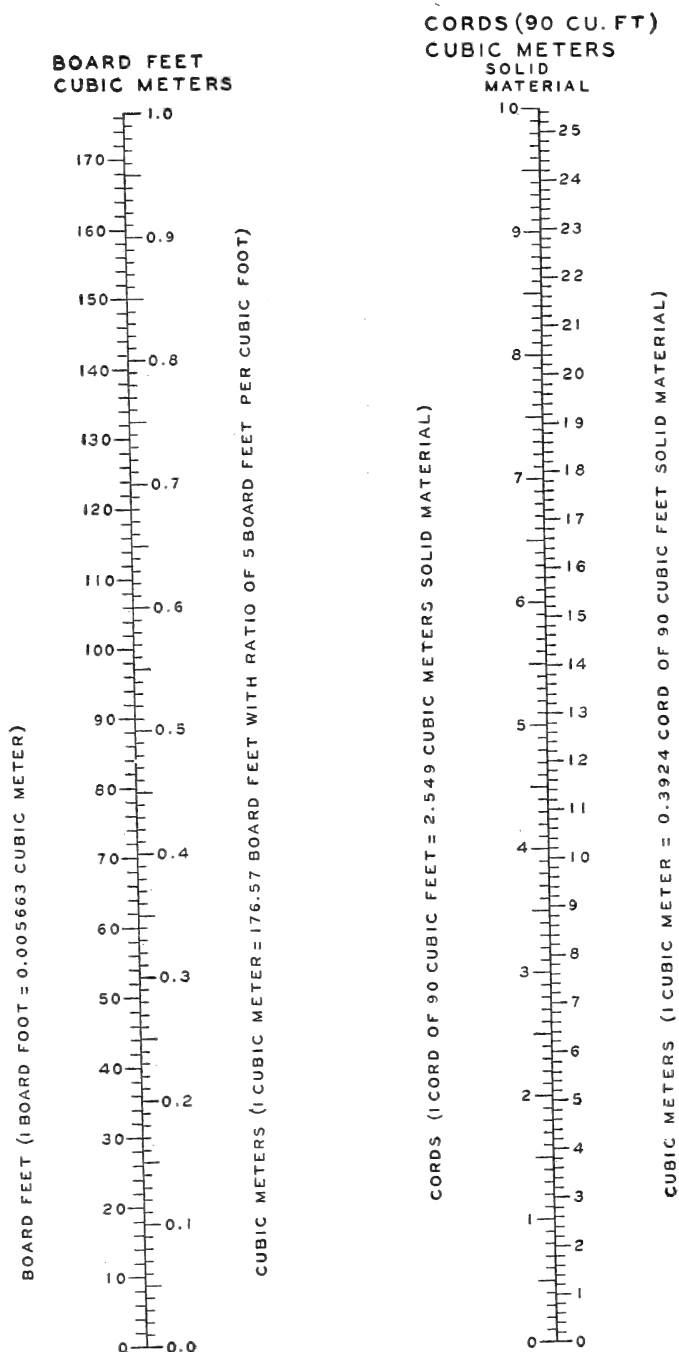
FIGURE 13.—Alinement charts for converting board feet to cubic meters and cords to cubic meters.

FIGURE 14.—Alinement charts for converting cords per acre to cubic meters per hectare and board feet per acre to cubic meters per hectare.
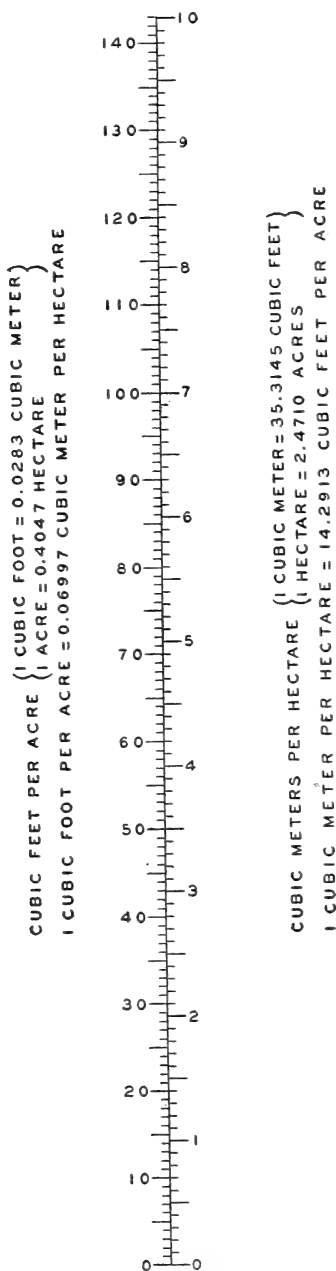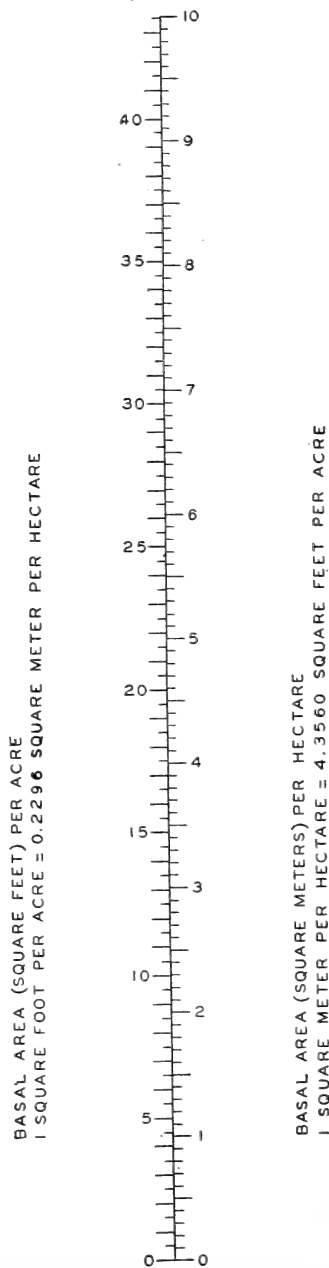
FIGURE 15.—Alinement charts for converting cubic feet per acre to cubic meters per hectare and basal area (square feet) per acre to basal area (square meters) per hectare.
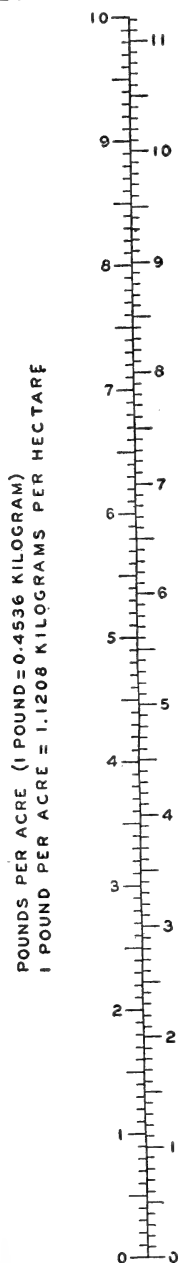
FIGURE 16.—Alinement charts for converting pounds per acre to kilograms per hectare and pounds per square inch to kilograms per square centimeter.

FIGURE 17.—Alinement charts for converting bushels per acre to hectoliters per hectare and pounds per cubic foot to kilograms per cubic meter.

CUBIC FEET PER SECOND
ACRE-FEET PER DAY
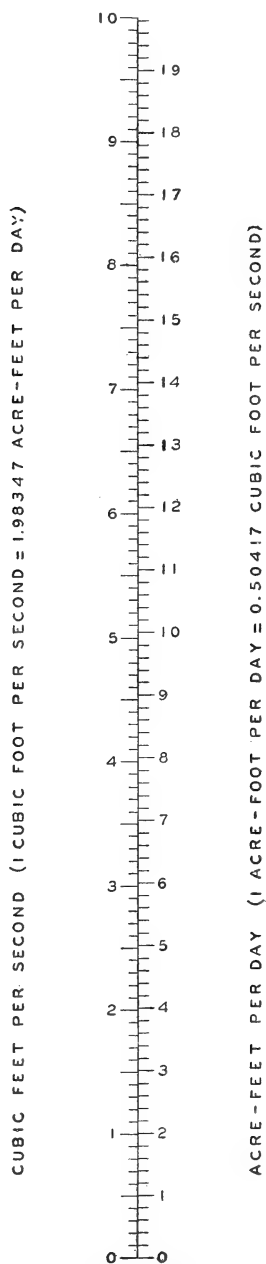
FIGURE 18.—Alinement chart for converting cubic feet per second to acre-feet per day
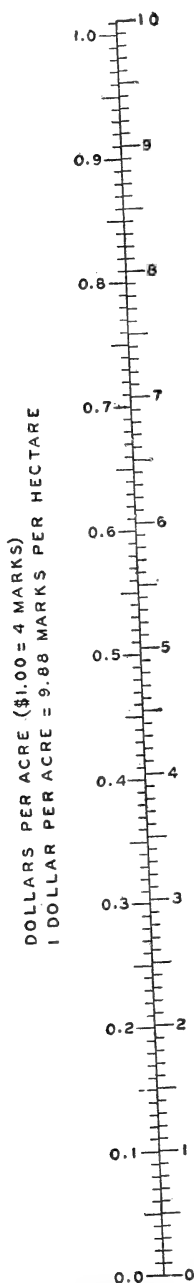
FIGURE 19.—Alinement chart for converting dollars per acre to marks per hectare. Value of foreign currency approximate.

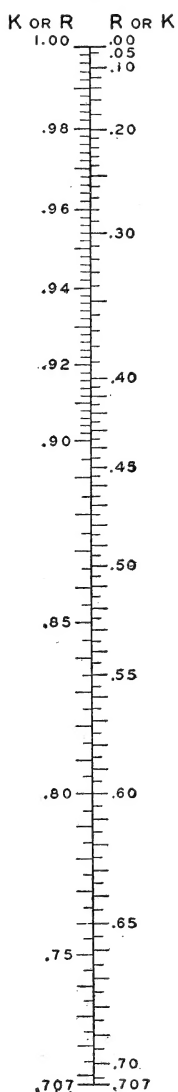RELATION OF COEFFICIENTS OF
CORRELATION (R) AND ALIENATION (K)

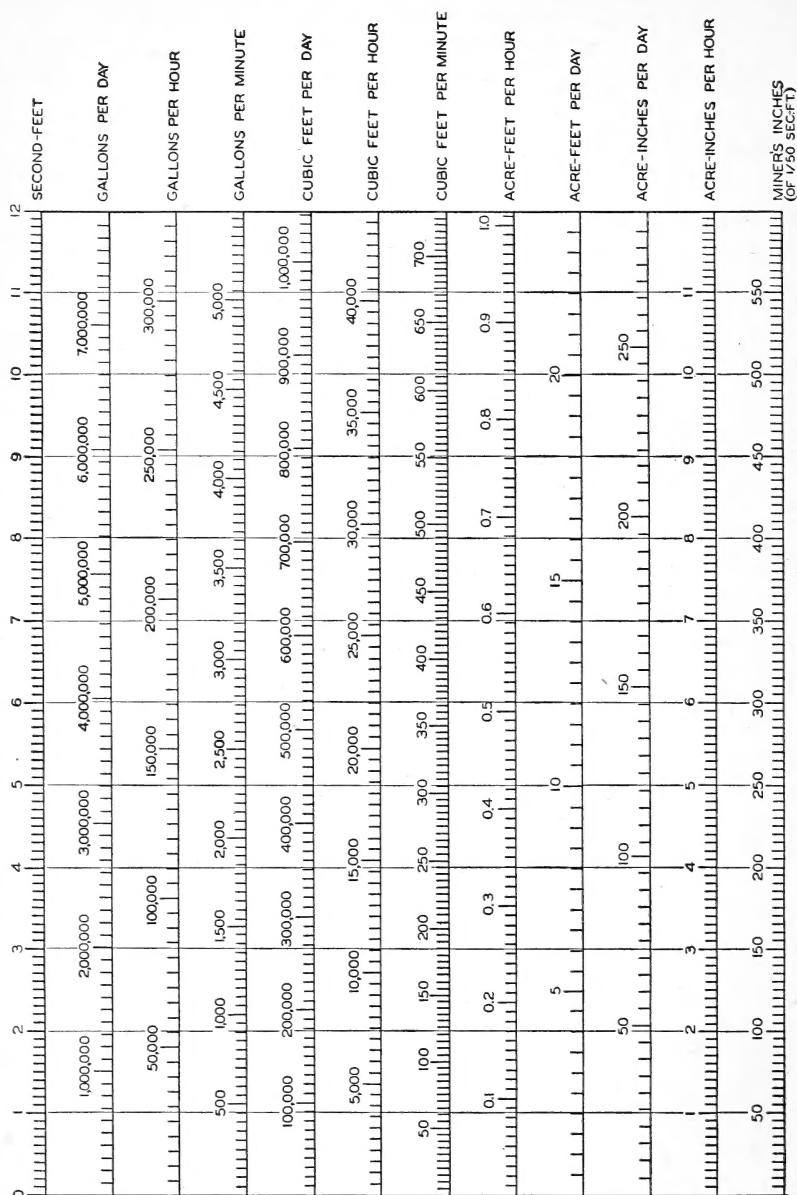| K or R	R or K
1.00	.00
	.05
	.10
.98	.20
.96	.30
.94	
.92	.40
.90	.45
	.50
.85	
	.55
.80	.60
	.65
.75	
	.70
.707	.707

FIGURE 20.—Coefficients of correlation.

FIGURE 21.—Alinement chart for determining equivalent rates of runoff.